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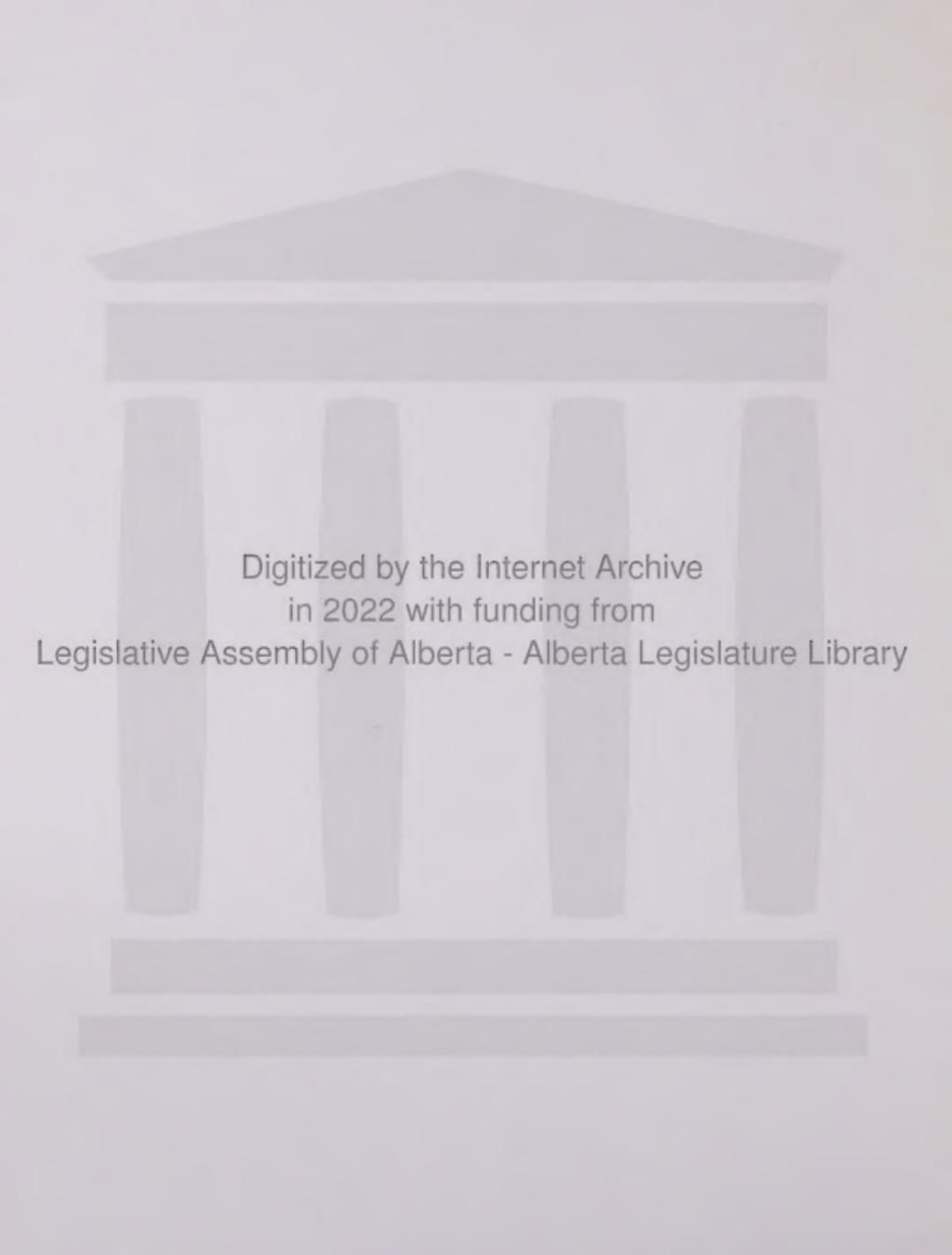
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## EXTENT OF SUPPLY

Here we have the question of renewable resources, and certainly the population of the earth is not only renewing itself regularly but steadily increasing. Without touching on the seriousness of the so-called Population Explosion, it would appear quite safe to say that the supply of manpower in the world is not a problem in terms of numbers only. Similarly the growth of markets based upon population will increase not only in numbers but in scope of wants and needs.

It appears that both nationally and provincially the supply of manpower has been adequate and will continue to be adequate for our production needs. Going back some thirty years, there was the period of surplus manpower and unemployment during the Thirties, the shortage during war years, the slight pause in '45 and '46 when some were worried about what the returned veterans would be doing, a near shortage for almost ten years from '46 to '56, and then more recently a near balance where in some categories there has been an adequate labour supply, in some cases a partial shortage, and in other cases a slight surplus.

You are well aware of the great production increase in the Province of Alberta in the field of manufacturing, but The Department of Industry and Development has encountered no case where production was curtailed because of lack of manpower. Similarly western Canadians have proved themselves most adaptable, with plenty of initiative, and capable of doing any task which they undertake. Further special training may be necessary but this will be touched on later.

Had Western Canada been dependent solely on our own population we would probably have had a serious labour shortage in the province in the past twenty years. However, a steady stream of immigration both from Europe, from U.S.A. and from other parts of Canada, has filled in where needed. There is a good degree of mobility to labour in Canada and apparently our own province is sufficiently attractive to encourage people to continue to come here.

For reference purposes I would include the following figures:

### POPULATION:

	<u>Alberta</u>	<u>Prairie</u>	<u>W. Canada</u>	<u>Canada</u>
1931	732,000	2,354,000	3,048,000	10,376,000
1941	796,000	2,522,000	3,340,000	11,507,000
1951	939,000	2,547,000	3,712,000	14,009,000
1956	1,123,000	2,854,000	4,253,000	16,081,000
1959	1,243,000	3,030,000	4,600,000	17,442,000
1985 (est.)	2,062,000	-	-	27,000,000

## "PEOPLE AS A NATURAL RESOURCE"

J. E. OBERHOLTZER  
Deputy Minister  
Department of Industry and Development

People, water and soil are certainly fundamental resources. Congratulations should go to the persons outlining this program in having presented topics of interest in a somewhat out of the ordinary context. We normally think of resources as the resources of the forest, the farm, the sea, minerals and so on. Some of these are renewable and some are not. The three we are considering this morning would appear to fall in the renewable class.

In earlier times there was a physical concept which indicated that all matter was made up of four elements, - fire, water, air and land. The fire and the air are omitted this morning and for good reason, as the matter of pollution of the air by fire, machines and other explosive means would probably lead to a full day's consideration. Water, soil, and the people dwelling thereon are probably sufficient for one session.

### DEFINITIONS

Perhaps we should turn for a moment to a definition of terms. The dictionary definition of "fundamental" is "serving as a base or foundation. Primary, original".

A "resource" is a means of supplying a want or need. "Resources" are a country's collective means for support and defence. Certainly "people" are any nation's most important resource, being the originators of the wants or needs and being a prime factor in any production process.

This is the aspect which we might consider this morning, that is - people as a resource in terms of production of goods and services. We might also keep in mind that "people" are two thirds of the three M's of production - Men, Materials and Management.

Perhaps we could spend a very short time now touching on the supply of this important resource, the best use of manpower resources and some thoughts on future trends. It is hoped that these introductory comments will encourage individual thoughts and questions which can be considered later.

## LABOUR FORCE:

	<u>Alberta</u>	<u>Prairie</u>	<u>W. Canada</u>	<u>Canada</u>
1931	286,000	895,200	1,201,400	3,921,800
1941	312,200	942,400	1,285,600	4,510,500
1951	353,900	954,600	1,399,000	5,179,600
1956 (est.)	421,000	1,007,000	1,481,000	5,764,000
1959 (est.)	466,000	1,091,000	1,661,000	6,300,000
1985 (est.)	773,300	-	-	10,125,000

## THE BEST USE OF OUR RESOURCES

On a theoretical basis it could be assumed that the best use of our manpower resources would be aimed at the greatest production per man per day. In case there are any doubts in anyone's mind about this, Canada-wide figures indicate that in the past sixty years there has been a 180% increase in productivity per worker per year although there has been a 30% decrease in the time spent working per day. Although the newspapers give a great deal of space to labour difficulties, strikes and so forth, the picture of Labour-Management harmony in Canada is relatively good and the picture in Alberta is by far the best in Canada. Time does not allow for a dissertation upon the question of labour-management relations in Alberta but obviously we are doing quite well. Briefly I would suggest that this is due to the use of common sense on behalf of management, a good attitude on the part of the rank and file of labour in the Province, plus a judicial use of regulations and guidance by the Provincial Government.

## FUTURE TRENDS

Some of the future trends related to the activities of people in the production field are self-evident. Automation is now becoming well established and its use will apparently continue to increase. This will not remove the need for people, but rather will increase individual productivity. At the same time changes will occur in the nature of many jobs and positions. This leads to the need for greater specialization in training. This is not necessarily engineering training, but technical emphasis in the elementary schools which may be followed by specialized technical training. Already the need for more technical schools and institutions of that type is evident. Most of you will be aware of the Provincial Government's plans for a Technical School in Edmonton.

Mass production will continue to be the pattern for obvious reasons. The increase of local population will lead to wider local markets, more local production to fill the needs of this market. This in turn will attract more people and the market will grow. Our Department looks forward to the next ten years as being a period of great growth in secondary industries. Fabrication plants of various types are expected to be established.

The trend toward automation and mass production will probably lead to still shorter hours, greater leisure time, which in turn will increase

the wants and needs of our people in the fields of recreation and in the pursuit of the cultural arts.

In all of these developments, the philosophical attitude toward "people" as part of the productive process should not lead to classifying them as so many "bodies" or "semi-robot machines" or even as "cogs in the wheel of production". The recognition of man as an individual is more and more evident in the studies of working conditions, labour relations and personnel problems. So much so that the modern production factory could hardly be recognized if placed along side its counterpart of even fifty years ago.

#### SUMMARY

In summary then,

- (1) We appear to have an adequate supply of people for present production.
- (2) We, in Western Canada, should welcome more people for markets and as workers.
- (3) In the fact of the specialization trends, we must not be complacent over our present training schemes and facilities. Steady advances are necessary here.
- (4) Individuals as well as companies and corporations in our province face increasing competition both for jobs within our province and competition from production elsewhere in Canada and in other parts of the world.

Perhaps this is biased, but I submit Mr. Chairman that "people" are our most important natural resource. As such, they and their problems warrant our continuous thought and careful consideration.

Some 200 years ago Alexander Pope wrote "Know then thyself, presume not God to scan; The proper study of mankind is Man".

This is still a pertinent axiom, even for a Resource Conference.

QUESTIONS

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QUESTION: Do Trade Unions help or Hinder the Productivity of the Natural Resource - People?

ANSWER: Production is how Trade Unions are here and the diversity of opinion whether trade unions help or hinder production is just about as strongly supported on one side as on the other. Without the old time factor in their working conditions, the new modern concept would not have been possible. I would hedge this question slightly and simply say this. In the figures of production that were given you earlier, there has been a 180% increase in productivity and a 30% decrease in time spent working per day. Although you might have gotten slightly higher production without any restrictions to time or working conditions, there is not much evidence that unionism has seriously deterred production. That is my particular opinion on the present picture.

QUESTION: (a) In which field(s) of production will competition become most noticeable?

(b) For which field is Technical and Technological training most needed?

ANSWER: (a) The field or fields of production where competition has become most noticeable and is showing up in Canada, are the fabric sales and textile fields. Competition in Europe is causing serious concern to the Canadian merchant in the field of secondary fabrication. Pottery workers in South America are under very severe competition. You might say that in the field of oil production it is serious but not so in factory production. Hand made articles are serious competition. Japanese hand made articles are a good example because they can do a better job than Canadians when working with their hands.

(b) I would think that in the field of electricity and the new control fields. You go into a place where scientific instruments show a whole wall of instrumental controls and buttons that a man is watching. Behind all this are levers and dials. Men must be trained so they will know and understand their field. This seems to be the field where most training is required. Considering the field of machine computers, some understanding of that is going to be necessary in the next generation. There should be a warning - there is going to be toucher and tougher competition in our Western Canada production from Europe, Japan and the U.S.A. This is serious competition. Competition is good - don't think we have it our own way, Speaking as a parent, your children and mine want good training. A grade 12 education is the bare basis.

QUESTION: Do you not feel that if Canada is to make her greatest contribution to the World tomorrow, there is a great need that we, as a people, turn again to the teaching of Christ, as laid down in the Sermon on the Mount? Must we not be ready to be our brothers keeper?

ANSWER: I think the answer is quite obvious. This is a period of much worry and concern and we certainly have to look to the philosophical aspects.

QUESTION: Do Alberta and Canada really need immigrants in view of population trends? Is not an immigrant cut into a pro rata share of our natural resources? Should Canada not require special skills from people who are admitted?

ANSWER: Again, I will have to remind you of personal opinion. I believe the facts of the case are this. That of the immigrants coming to Canada and post-war immigrants, they have literally created more jobs in manufacturing fields than they have taken up. New skills and production knowledge have resulted in and profited in more jobs than they have taken away. The policy as suggested by the labour representatives was by careful selection. Getting some of these people into a corner where they were not so strong. This may be more of a personal nature. Personally I am a little inclined to favour a wider open policy. There is plenty of space in Canada and if we are to produce for other people we need more people.

## "THE UTILIZATION OF WATER FOR AGRICULTURAL PURPOSES"

C. J. McANDREWS  
Colonization Manager  
St. Mary and Milk Rivers Irrigation

The allocation of water resources is a critical problem in the field of agriculture. It has been found that it is much more than an engineering consideration. The economic unit, which is the farm, requires very careful and thorough consideration. The writer shall attempt to outline the principal factors which affect the allocation and utilization of water for agricultural purposes.

Water resources consist of both stock and flow reserves which are available to be allocated for the benefit of society. Precipitation is intermittent, but rather dependable when the use is adapted to the general trend of frequency and amount. Streams can be continuous or intermittent, being either definite or indefinite in source and supply. Lakes and reservoirs build up a stock resource to provide dependable supplies. Ground water reserves are believed to be widespread and variable, but are relatively unexplored. The efficiency of allocation for the various uses of water is a part of conservation and reclamation. It depends upon the policy of the country, foreign affairs, and domestic goals. Population trends, food requirements and technological advancements are considerations which may establish a long run policy for equality in resource use by our descendants. This would seem to be preferred rather than developing water resources on a short run policy such as for food in time of war, providing settlement for returned war veterans, or for providing work for unemployed. The goals to be obtained are:-

- (1) Economic progress
- (2) Economic stabilization
- (3) Economic justice
- (4) Economic freedom

### WATER POLICY

Water policy in the Province of Alberta is established under a body of water laws, The Water Resources Act being Chapter 362 of the Revised Statutes of Alberta, 1955, contains the basic laws. Some of the more important features shall be mentioned here. The traditional riparian rights doctrine is preserved to protect any person owning or occupying land that adjoins a river, stream, lake, or other body of water, to use such quantity of that water as he requires for domestic purposes on the land. The property of water is vested in the province, and the right to

divert and utilize water is obtained upon application to the Minister of Agriculture. Priority is given on the basis of the date of filing of applications with the Minister, with precedence given in the following order:-

- (1) Domestic purposes
- (2) Municipal purposes
- (3) Industrial purposes
- (4) Irrigation purposes
- (5) Water power purposes
- (6) Other purposes

Any person requiring water for a purpose that has precedence over a purpose for which water is being used, may make application for cancellation of the previous right. If such cancellation is approved, the new purpose is given the priority of the right that it replaces, and the owners of the cancelled right and any other right that may be affected are entitled to compensation by the applicant. The water right is pertinent to the land specified in the license, and is inseparable therefrom, and passes with the land upon any disposition of it. A license may be cancelled in cases of abandonment, waste, default in payment, breach or non-performance or the failure to observe or perform, fraud or imposition, or error in issue, with regard to the license or provisions of the Act, or regulations. The amount of water on a license may be reduced if waste or other reasons occur that warrant such action. Provincial pacts and international agreements affect the amount of water that may flow into, or out from the province.

#### USES OF WATER

Water is used in many different ways. The "natural use" of water that is essential for man's survival must be given prime consideration over the extraordinary use for purposes of comfort and prosperity. Domestic water that is used for drinking, cooking and sanitation, is quite essential, but certain cases such as for resorts, or army camps, which are using domestic water, may be questionable. The use might be considered as "extraordinary". There should also probably be a limit under natural use of water for livestock purposes, this being perhaps the number of livestock required to sustain a family. Irrigation is essential for man's survival on a local basis, but may be considered at least to some extent as merely adding to the comfort and prosperity of certain groups of society. This is particularly true when considering the benefits that accrue to commercial and professional agencies in an irrigated district. The value and importance

of food decides whether irrigation is a natural or extraordinary use, as the benefits to local individuals must be compared with alternative locations and employment for them. The use of water for power, mining, recreation, the fishing industry, dissolution of sewage, the need for ice and other purposes, should also receive this consideration in any water resource allocations.

#### LAND PROBLEMS

Land surveys on the grid system have caused additional problems in the utilization and control of water. Large river basins extend into different countries and provinces where regulation of water policy in one part may affect another. Co-ordination and toleration is necessary for the overall control of such a basin. Water does not tend to follow straight lines and consequently streams traverse land parcels dividing them into irregular areas. Small impractical fields are often the result. Isolated areas are also found. Highway construction may channel waters together causing flooding or erosion during periods of peak run-off. The same problems occur in the construction of an irrigation project as canals are constructed along land contours. This lack of compatibility with nature tends to cause man-made features to be more costly, and water and land use less efficient.

Land classification to determine the feasibility of land for the beneficial utilization of water for agricultural purposes under irrigation is very important. Soils must have a potential productivity many times greater than that achieved with natural precipitation. They must be durable and possess characteristics that permit water infiltration, internal drainage, and ample water holding capacity. Water-logging and water movement that tend to accumulate the salts of soils on the land surface are undesirable. Topography must be of sufficient uniform grade or within economic limits that will permit uniform grading so that water may be conveyed and applied equally and evenly to all parts of each field. Lands classified as feasible to utilize water should yield a net return to the land. As water becomes scarce, as eventually will happen, a problematic question arises; "Should water be reserved for lands that may sometime in the future become economically feasible for irrigation?".

Land tenure influences water resource development. The expenditure of public funds are usually most desirably allotted to serve the most people or the greatest service to society. Privately owned lands in a proposed irrigation or drainage project may be held in large blocks by only a few persons. This situation does exist in some of the drought areas that are, or could be irrigated. Many large land holders are not anxious to resort to the more intensive irrigated agriculture as they have established a comfortable livelihood through the extensive farming of large areas. There is also considerable

opposition to the severance of private lands with canals and drains. The acquisition or expropriation of land for such development works is difficult and often unpopular.

Public lands, if they occur in large blocks, on the other hand can be readily developed and allotted in uniform parcels to a much larger segment of society. Even the grid-land survey can be discarded in some districts to provide economy of construction, maintenance and operation, and to also facilitate improved conservation in the field phase of farm practises.

The economy of agricultural water resource development is difficult to comprehend due to many related complexities, and consequently is seldom understood. The common procedure of construction of a project does not complete the development. Water is stored, diverted, transported, and distributed to a point of delivery on each farm of an irrigation project by the constructed works. The economic unit upon which the success of the project depends is the farm parcel which must be developed by the land owner. The farm operator is usually inexperienced in farm methods that are conducive to irrigation. He is also limited in means to develop the land to the new system which is very expensive. Heavy capital expenditures are necessary to level the land, establish a farm irrigation system, operate a program of special seeding and fertilization, purchase special equipment, increase livestock, and provide special storage facilities for produce. Private capital is too frequently lacking or reluctant to invest in agricultural programs. Thus, a great lag in land utilization occurs, causing a lag in water utilization with failures and loss of progress. We have never lost a dam, but we have lost many economic and social implications of irrigation development.

The transition period in land and water utilization depends mostly upon markets. High value crops and livestock must be in demand at high prices for the process of development to take place over a short number of years. The timing and rate of project development should therefore be co-ordinated to meet the market demand. Considerable planning and foresight is required so that projects are not constructed too early or too late. In general, the history of Alberta irrigation development appears to indicate that project construction has greatly exceeded market demands.

The value of water does not tend to show in the price that the user offers for it. Only when water becomes very scarce and the demand and alternatives for its use is great, shall it reflect its true value. Values tend to accrue primarily to land as noted by the increased land values as the lands gradually develop into sound and stable irrigation economy. The greatest benefits in the agricultural industry are most commonly found in the processing, packaging, and distribution for sale of the produce. The value of water to this phase

of the industry is not easily evaluated and is usually ignored. Only net revenues from farming ventures on a "with" and "without" water basis tend to indicate the value of water, and even these values seem to revert to land rather than to water.

### WATER AS A FACTOR OF PRODUCTION

The major agricultural goals are:-

- (1) Maximum profits
- (2) Steady profits (stability of income)
- (3) Diversification and intensification with flexibility
- (4) Accumulation of reserves or insurance
- (5) Integration of farm enterprises

The addition of water to land, labour, capital and management can be of tremendous assistance in achieving these goals. Management becomes very important for the purpose of allocating and co-ordinating each contributing factor in such a way that each program in a farm operation is contributing to the success of the other rather than competing with each other.

The control of such an important growth factor as water, is a major contributor to success in agriculture. Increased production at optimum levels of overhead, capital, labour, and expenses tends to maximize profits. A constant supply of soil moisture, or the relief from excess of water, tends to stabilize income as droughts and floods are prevented. This enables more variety in cropping and farm programmes with intensification of production through the use of fertilizers, rotations, weed and insect control, and other technological advancements. Feed reserves for livestock assures the farm of a permanent herd. Capital reserves are also desirable to carry the farmer through periods of adverse marketing conditions. Water development projects tend to integrate grain production, ranching, cash crops and permanent employment as each is complimentary to the other when brought together, or into close proximity of one another.

### MANAGEMENT OF WATER

Water is extremely hazardous, being capable of doing enormous damage when allowed to flow uncontrolled. Technical knowledge of a very high plain is required to properly convey, hold, apply, or drain water under artificial conditions. Erosion removes fertile soil, while leaching carries the fertility to depths below the reach of plant roots. Seepage causes the accumulation of water and salts creating

unproductive water-logged or alkali areas. Intensive production can deplete fertility of soil, which must be restored by the use of crop rotation, fertilizer, green manure and bard yard manure. Weed seeds are readily carried by water, and are usually laid down with ample moisture to promote their growth. The control of water, soil, crops, and the need for sufficient suitable enterprises to take advantage of the benefits of water are all quite essential.

The management of water is often given much more attention and consideration in the construction and development of new projects, rather than in the conservation of existing projects. The accomplishments of designing and constructing works that are entirely new, is much more satisfying and glamorous than a job of rehabilitation on an old project. Existing projects are proven assets which should be reserved by the practice of preventative maintenance and by reclamation where necessary.

A very common management problem on irrigated lands is the competition between rainfall and irrigating. The former is free with no labour requirement, the latter being supplied at a cost with a considerably high labour requirement. The typical irrigator is very apt to wait in the hope of receiving precipitation until at least part of the crop suffers from drought before it is irrigated.

#### COMPETITION IN USES OF WATER

The multi purpose uses for flood control, navigation, power, irrigation, industry, recreation, and other purposes are often complimentary to each other in the development of projects. Multi purpose projects in Alberta are not common, although many of them do actually serve more than one purpose, even though they may not be recognized for it. Cost sharing of the construction is probably the greatest advantage. Many problems, however, do arise. The same water may be required for irrigation as is used for power. Lakes or swamps that may be desirable for recreation, may be drained by an agricultural reclamation program. Reservoirs created by power dams may flood large acreages of arable land. The advantages and disadvantages must be considered for the benefit of society as a whole.

The allocation of water resources must consider all the alternative uses that can be made of water. The industrial production from one gallon of water in the United States is stated to be worth .5\$, whereas the agricultural production of water is worth only .1\$. These figures would tend to favour the purpose of industry over that of agriculture. However, the study must go beyond the actual production value, and consider extra market values and human rights values. These are very difficult to appraise, but usually do influence decision making.

The following are rough examples of agricultural production:-

An acre of sugar beets requires 1.5 to 2 acre feet of irrigation water. A similar amount of water is quite commonly lost by way of seepage and evaporation from reservoirs and canals before the water reaches the farm. Therefore, approximately 4 acre feet of irrigation water produces about 15 tons of sugar beets, which, if valued at \$15 per ton would be worth \$225.00. One gallon of water in this case has produced .02¢ worth of sugar beets which is approximately .04¢ worth of sugar in the wholesale house. If the waste water was eliminated, each gallon of water would produce approximately 01¢ worth of sugar.

The same 4 acre feet of water at the head works of a project may produce approximately 150 bushels of oats on the farm. The same farm, without the irrigation water, might produce approximately 50 bushels of oats. The additional water, therefore, produces 100 bushels of oats, which, at .60¢ a bushel equals \$60.00. The water is, therefore, three and a half times more valuable in sugar than it is in oats.

Many of these problems do not worry us in our present use of water, as we are fortunate to have a plentiful supply. It does appear, however, that it will not be too long before the various purposes for use of water will be in competition. Our neighbours to the South along the Eastern slopes of the Rocky Mountains, do not have enough water to fully develop their agriculture and industry. Water is being conveyed from the Western slope to the Eastern slopes for irrigation purposes. I understand that the City of Colorado Springs offered to buy the water rights of an irrigation project at approximately \$1,800.00 per acre for the rights only, so that the rapidly growing city would be assured of domestic water. The Western provinces of Canada are gradually allocating and developing their water resources with signs of increasing competition for the supplies that remain.

The United States manages to use only one fifth of the total run-off that occurs over the length and breadth of the nation. While this is true, they experience considerable shortage and expend tremendous effort to obtain more water in many parts of the country. I would suggest that we are using considerably less of our total run-off than does the United States. However, we must remember that a considerable amount of run-off occurs where there is little value for making use of it, or where the cost of making use of it would be prohibitive. We must also remember however, that it is very easy to waste water and that we do waste water that can be put to beneficial use. It would be advisable to be conservation conscious and learn to preserve and make efficient use of water before the time of scarce resources is with us.

## QUESTIONS.

QUESTION: What is the possibility of using ground water (wells) for irrigation in Alberta?

ANSWER: This question is very difficult to answer because ground water supply is relatively unexplored. However, I believe the general opinion would probably be not too much possibility. There is a good possibility though, that a good deal of our larger reserves of water are too salty for agricultural purposes.

QUESTION: Your talk suggested the use of water consider the broader needs of society as a whole. Why then do you relegate recreational use to the category of "extraordinary" uses?

ANSWER: I definitely think that the natural use is that use which is essential for survival of man. I feel perhaps, recreation is essential for a long full life so I place recreation as a phase that is not absolutely essential for the survival of man. The ordinary uses of water are quite broad. The purpose for increasing our income and pleasures place recreation as "extraordinary".

QUESTION: Do you think an entire river system should be developed as a single system to obtain maximum productivity from the water resource rather than have a river system developed by many provinces and private firms? For example: The Peace River System?

ANSWER: Certainly the overall development of a reserve basin should be co-ordinated. It is not necessary to have it in one system and get the ultimate production out of it. It is quite essential to co-ordinate the various phases, particularly the allocation of water at river basins.

QUESTION: What is being done in the province on watershed research aimed at maximum supply from the East Slope area?

ANSWER: The East Rockies Conservation Board are doing a considerable amount of work on the eastern slopes in view of conservation of water, land and forests. There is also other work being done by the Federal Government planning for future research.

QUESTION: How much thought is given to recreational values in planning irrigation reservoirs?

ANSWER: The thought that is going to plan is somewhat variable and depends to a great extent on the interest that is contributed by those interested in recreation. There are several problems. The major one which we may be able to show is reservoir fluctuation during the summer season and that creates some problem for recreation, as in the spring the water is quite high. By mid-summer or late summer the water can be quite low. This problem is something that must occur for the benefit of irrigation. However, most of our irrigation people are mindful of recreation and encourage the workers and are anxious to improve the co-ordination of recreation and irrigation.

QUESTION: Are there prior rights in regards to subterranean water? Asked in respect to use of sub-surface water, by an oil company for a water flood program.

ANSWER: The only answer I can give you is that we must license the use of any water and once licensed it has a prior right. If ground water is licensed the prior license has prior right.

QUESTION: Does the utilization of underground water affect regional surface flow by increasing percolation and does it affect underground sources 'downstream' significantly - if this is so, might greater control of underground water be necessary?

ANSWER: (Unavailable).

QUESTION: How is ownership of water determined? e.g. A small lake in the centre of an area owned by an individual.

ANSWER: Our water policy in the Province of Alberta vests the property of water in the Province, therefore water is owned not by the landowner but by the Queen. Uses of water for domestic purposes has a prior right. The uses for any other purposes must be licensed. In that regard we do not own the water but have the right to use it.



## "THE UTILIZATION OF OUR SOIL RESOURCE"

W. E. BOWSER  
Sr. Pedologist  
Canadian Department of Agriculture

Last year Dean Bentley gave you an appraisal of our soil resources. Possibly we should very briefly review this. Alberta has a total area of 163,000,000 acres. If we eliminate, as non-arable, the mountains, the hilly areas, the sand dune areas, the Precambrian shield, the rivers and lakes, the muskegs, and all the land used by parks, urban development, industrial development, and roads (which add up to nearly 100 million) we immediately reduce the 163 million to 65 million. Today we cultivate about 25 million acres, most of it lying south and east of Barrhead and in a triangle between Beaverlodge, Hines Creek and High Prairie. In these areas most of the arable land is now cultivated. Therefore, the 40 million acres (the difference between the 65 remainder and the 25 cultivated) lies north and west of Edmonton. Possibly all of this could some day be cultivated; generally, however, it is of low fertility and inferior to much of the presently cultivated land. In this era of increasing world population it could, and some day may, provide living space. However, in shorter term thinking our soil resource is the 25 million acres already cultivated, plus, possibly, five or ten million more in the undeveloped portion of the province.

How have we used the 25 million acres already cultivated? The first agricultural development, of any magnitude, on the Western Prairies, was on the Red River Valley (the Selkirk Settlement) in the early 1800's. Although it underwent many hardships and frustrations, it did arouse an interest in the agricultural possibilities of the Canadian West - an interest, I believe, not shared by the fur traders.

This interest prompted the British Government to send Captain Palliser to the Prairies in 1856 to study its agricultural and other possibilities. In his report he virtually wrote off the Grassland portion of the Prairies (south-eastern Alberta and south-western Saskatchewan) saying it was valueless - the grass being very scant and the timber very scarce. He was more favorably impressed with the Parkland portion - the area from Brandon - to Yorkton, Saskatchewan and Edmonton - describing it as fine country, abundant in vegetable mould, fit for pasturage and tillage.

During the three decades following his visit there was very little agricultural expansion except for some large cattle ranches, particularly in the area between Maple Creek and the Foothills. It was not until after the building of the Canadian Pacific Railway that extensive settlement actually began. Prior to this, however, the

Canadian government had sent its own investigators, one a Dr. John Macoun, to assess the agricultural possibilities of the West. In many respects Macoun's report was quite different - in fact, contrary - to Captain Palliser's. At least one reason for this was that Captain Palliser visited the West during a series of dry years, Dr. Macoun during a period of wet years. In fact, these alternating wet and dry periods have been responsible for one of the major problems in Western agriculture.

Following the building of the railway the government of Canada engaged in an active settlement policy. They granted a free (160 acre) homestead to each settler. This 160 acres soon proved to be much too small a unit, particularly in the dryer sections. It is worthy to note that the farmers who came west, the government who framed the settlement policy and their technical advisors, were, in the main, people from humid areas: areas where climate, soil and adaptable crops were quite different to what they were on the semi-arid prairies. They had little, or no, first hand experience on which to draw.

The land agent, however, soon coined a word for the soil - it was all "chocolate loam" - an alluring sound. When we add to this the stories of prairie towns "paved with gold" and farm homes "papered with greenbacks", the lure was complete. In point of fact; the streets were paved with gumbo and the shacks often papered with pages from mail order catalogue. The early settler was rather like the seeds scattered by the biblical sower. Some fell on stony ground, some on sandy or salty soil, some on good ground. And, in general, the individual homesteader had little more choice as to where he landed than did the seeds in the sower's grain sack. Even as early as 1895 there were many abandoned homesteads - forced out by poor soil or prolonged drought.

The large influx of settlers took place between 1900 and 1914. This coincided with the era of railway expansion - Alberta actually "filled up" during that period. From 1914 to the 30's there was a slow but steady growth. The drought and depression of the 30's, however, forced mass evacuation from some areas, particularly from the semi-arid brown soil zone. Many of these evacuees moved to the wooded areas and this marked the first extensive settlement of the Grey Wooded soil. These soils have presented management problems quite different to those encountered in the soils of the Grasslands: being low in native fertility the value of fertilizers and legumes was early recognized.

The story of settlement in Alberta is told briefly in the following figures. In 1890 there were 50,000 acres cultivated, by 1920 there were over 10 million acres cultivated, by 1940 over 18 million, and today almost 25 million. It is of interest to note that in 1920 there were 80,000 farms; this meant an average of 125 acres

of cultivated land per farm. By 1940 the number of farms had increased to 100,000 but today it is back to 80,000. This means that today the average size of farm is over 300 acres.

Wheat has been, and still is, the principal crop in Western Canada. It was soon discovered that wheat could be grown on the prairies and as early as 1885 the Federal Government's agriculturists were engaged in research pertaining to prairie agriculture. Two "discoveries" were of major importance as far as land utilization was concerned. One was the development of the summerfallow system, and the other the selection of Marquis wheat. These developments coincided with a great increase in world demand for wheat, an increase in world wheat prices, and a vast improvement in transportation facilities, both on land and water.

So great was the expansion of wheat production on the Prairies that by 1920 wheat was Canada's major export and the whole economy of Canada was geared to, and dependent on, her wheat production. By 1930 40 percent of the wheat that entered international trade was contributed by Canada.

What did this mean in terms of land use? Wheat was mainly grown in a one crop rotation: - wheat - fallow or wheat - a coarse grain - fallow. A large portion of the crop was removed and shipped out of the country. This was a somewhat new departure in the use of agricultural products. In some of the old civilizations, along the Ganges, Indies, Euphrates, and Nile rivers - cultivation has gone on for thousands of years but what was grown was consumed at home, and eventually all was returned back to the land from whence it came. In Europe - in England - where cultivation has been fairly extensive for over a thousand years, little was taken away. Here it was different. For example; Phosphorus is an essential mineral plant food but is in limited supply in our soils. In an average year we export via wheat - to say nothing of beef and pork - about 25,000 tons of Phosphorus, worth today in the fertilizer bag almost ten million dollars. Also, the grain - fallow system is very destructive of the organic matter - the humus - in the soil. It has been determined that we lost nearly 25 percent of the soils' organic matter during the first 25 years of cultivation.

It was the advent of the 30's that brought many of the shortcomings of our farm practices into sharp focus. Successive dry years showed that the loss of organic matter had left our soil vulnerable to wind and water erosion. The removal of readily available plant nutrients showed that this "fertile" soil of ours was already needing the addition of artificial fertilizers. The semi-arid Brown and Dark Brown soils were initially rather low in organic matter, therefore, the loss there became apparent fairly soon. The advent of the combine, which leaves the straw on the land, has, in part, arrested this decrease in organic matter. Our Black soils, however, were

initially quite rich in organic content, and the loss in these, although just as great, went unnoticed for a longer period of time.

Two other things happened about this time. We came to the realization that the supply of new land was limited - that we had reached the last West. Also, wheat lost its monopolistic place in the Canadian economy. Industry, including lumbering and mining, was fast growing in importance and was seriously competing with agriculture in the labor market.

What has happened in the last 25 years? As a result of experience and research we have returned large areas of marginal and sub-marginal land back to pasture. We have been slowly opening up the more humid, but less fertile, wooded soil areas for settlement. We have gone from horse farming to tractor farming which has, in Alberta alone, released over five million acres of land to grow food for human consumption rather than fuel for horses. We have become a little more conservation-minded; we are growing a little more legume and other hay crops and have slightly reduced the percentage of summerfallow. But we are still far from utilizing our soil resources on a basis conducive to permanent agriculture.

We are not farming as well as we know how; the farmer contends that he is farming as well as he can afford to.

At the Experimental Farm at Lacombe we have had various crop rotations under test for 40 years. The common wheat - wheat - fallow rotation has produced a little less than one ton of dry matter per year. A seven-year rotation, including wheat, oats, potatoes, and hay, has produced two tons; and a six-year rotation, including wheat, barley, corn, and hay, has produced three tons. The dollar return has also been in favor of the last two rotations. We are learning how. The question is: Is it possible for our farmers to adapt these rotations on an extensive scale?

And now to summarize:

- (1) We are a young country - our soils have only been cultivated for 50 years - yet many are already showing signs of deterioration.
- (2) During this short period there has been a significant shifting in demand for the products of our soil.
- (3) There has been a very rapid mechanization of agriculture, during this period, accompanied by a virtual disappearance of the traditional farm labor force.

- (4) Alberta - and all Western Canada - has a wide variety of soil types, each requiring a different management practice.
- (5) Added to these is the probability of a fantastic increase in world population - particularly in food deficiency areas - and hence the probability, in the not too distant future, that our soil will be called on to become, once more, one of the world's major bread baskets.

In such a diverse and often conflicting atmosphere it is not surprising that we have yet to develop a satisfactory land use pattern.

## QUESTIONS

QUESTION: Do you anticipate the development of management practices, whereby the large areas of muskeg can be profitably farmed?

ANSWER: No; As support of that, in Europe where there are large areas of muskeg and where land is much more intensively used there are still large areas of muskeg lands that are still fertile so that I do not think we can consider that non-arable. We class them as to either mode and originality and there are some that are reasonably fertile and some which are very, very low in fertility which are never used for anything.

QUESTION: Should not our goal be increased fertility of agricultural soils and forest soils by management? Is this possible in the long view?

ANSWER: Yes, it is our goal. I think then it is true to say that in our present cultivated areas we are possibly at one-half of the maximum production. I said that our problem was that we have possibly 5,000,000 or 10,000,000 acres more in the undeveloped portion of the province. Thinking in terms of increasing production we have to prime them up, increasing the production of presently increasing sales and that means increasing fertility and better management. We can do a lot by straight management practice. Possibly considerable thought has to be given to that because fertilizer becomes more and more expensive and there are certain kinds that may become less and less. Some people say the end of the world will come when we run out of fertilizer. At the rate it is being used, we can run out. We might simply use the Atomic Bomb.

## "BREEDING VARIETIES OF CROP PLANTS FOR ALBERTA CONDITIONS"

DR. JOHN UNRAU  
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In the final analysis, it is the outstanding achievement of plant breeding that has made agriculture successful in Western Canada. Permit me briefly, as part of the introduction, to sketch the historical basis for the rather broad, bold statement.

The first record of grain harvested in Western Canada is that of 230 gallons of wheat harvested by the Selkirk settlers in 1814. Records are not available to indicate what variety it was. Red Fife, the variety that had sufficient earliness in most years in the Red River Valley was brought in about 1868, and the first shipment of 1,000 bushels of wheat, Manitoba No. 1 Hard, was sent to Britain in 1884. This shipment undoubtedly established the reputation of the quality of Canadian Hard Red Spring wheat. It was a wheat of excellent quality, but, because of lateness, only a limited area could produce it.

From here one can truthfully say that the extension of settlement went hand in hand with the development of varieties better adapted to the very demanding climatic conditions of the Great Plains. Thus we had Marquis, the grand old man, if you like, of the hard spring wheats of North America. Its deficiencies were primarily lack of rust resistance and insufficient earliness for the northern and foothills areas. Varieties such as Red Bobs, Garnet and Saunders have reduced the danger of fall frosts in more northerly areas. The drama of the battle against rust, of the victories and setbacks could well represent the topic of a single lecture. Not only is a variety like Thatcher resistant to rust, it also is earlier and higher yielding than Marquis, the variety it replaced.

The story of wheat improvement by breeding is paralleled in other crops, though the results have not caught public attention to the same extent.

All in all, it was the development of better suited and adapted varieties that permitted agriculture to develop as it did where it did. The rewards reaped in terms of earlier, better quality crops and higher yields are very substantial. Thus it is a conservative estimate that the use of new varieties of wheat results in an increased production of well over 100 million bushels annually. The use of improved varieties of coarse grains, also, contributes at least a similar increase to our production. Perhaps it needs to be emphasized that the consumer even more than the producer benefits from this increase in efficiency through lower relative cost of the commodities involved.

Let me now discuss briefly some of the breeding problems as I see them for Alberta, what is being done about them and how this, in my opinion, compares with what should be done.

Firstly, it should be realized the climatic and soil conditions of the province vary tremendously. This means that crops and varieties are required that may differ widely in order to be adapted to these widely differing growing conditions. Not only is there a great total difference in climatic conditions from the south to the north and also from the east to the foothills, there are fairly sharp differences within fairly short distances. For example, the average temperature at Medicine Hat for an average of 54 years for the months April to September inclusive is 60°F., while at Brooks only 70 miles away the average temperature for the same period was 54.2° F., a difference great enough to make some crops quite safe at Medicine Hat but risky at Brooks. This situation is repeated many times throughout the province of Alberta, so that for some crops at least, one must definitely think of breeding on a regional basis.

It is absolutely impossible to give in the time available an account of what has been accomplished so far as breeding is concerned for the different areas, what is being done and what should be done. I will attempt to state briefly what might be some guiding principles both with respect to administrative policy and actual breeding objectives and procedures. I hasten to add that these are my views and that they are not necessarily shared by fellow breeders much less, of course, by administrators.

#### BREEDING PROBLEMS

##### 1. Problem Limiting Production and Importance of the Crop

Here while there is no standard policy it is quite clear that the extent and importance of the crop has dictated to a large extent the amount of emphasis that is given to breeding of a crop. This is easily illustrated with the scale to which breeding and related research dealing with the rust hazard has been expanded. The dramatic effects of the destructive action of rust and the impact from seeing a good crop of a rust resistant variety saved and a neighbouring crop destroyed certainly result in convincing pressure to increase the rust research program both from the standpoint of staff and facilities. The development of sawfly resistant varieties illustrates similarly the situation of a problem limiting production.

##### 2. Problem of Raising and Safeguarding Production

The difficulty is much greater if the problem is not a completely limiting factor so far as production is concerned, and it is in this area that lack of emphasis and effort has and continues to check progress that would be possible. This situation again can be illustrated with specific examples.

Large areas of Alberta, that is, the north central and northern area are climatically suited for the production of barley, specifically malting barley. The variety Olli, an introduction from Finland because of its earliness and good malting characteristics, has continued to occupy large proportions of this area. It is, however, one of the lowest yielding varieties in existence. Also, it is roughawned and weak strawed so that it is a simple matter to demonstrate that from the standpoint of total income it is much less of a profitable crop than other crops. The important point, however, is that there is no dramatic crop loss resulting from the growing of this variety, so that there is little pressure by growers put on administrators to increase breeding efforts. The results of this situation are quite apparent. We have had until recently only one serious long term program aimed at replacing Olli with a better variety, and that on a very small scale. The variety Gateway was the result. Because it was not "quite" acceptable to the malting trade, we must conclude that the program was not successful. It was not because there was not sufficient effort given to it. Even so there was partial success, for the new variety is now grown on some 334 thousand acres. This conservatively estimated represents an increase in production of well over a million bushels. Looked at it another way, even only partial breeding success represents an annual increase in income to the farmers affected of around 3/4 million dollars.

### 3. Breeding Work on Specialty Crops

The situation here is that usually the administration convinces itself that something needs to be done about specialty crops. Normally what happens then is that one person is assigned a number of crops. It should be perfectly obvious, however, that the technical problems of making any advance by breeding in these crops are just as great as those in a crop of major importance. That is to say, it is just as difficult to breed a variety of soft white spring wheat with resistance to rust, and satisfactory quality and agronomic characters as it is in the case of hard red spring wheat, yet for one there may be the part time service of one plant breeder while for the other there may be dozens of breeders. If any progress at all is to be made in breeding of specialty crops for special areas, it seems to me that one crop with one problem at a time must be made the main responsibility of at least one breeder. I should like to illustrate the importance of concentration with my own experience in the development of the soft white spring variety Kenhi.

Over a period of some ten or so years western milling companies had found they could manufacture a satisfactory pastry and cake flour from soft white spring grown under irrigation. The variety Lemhi had the right kind of quality for the miller and certainly because of its high yield was suitable for the farmer. It has, however, no resistance to leaf or stem rust, and in some years the epidemics especially of stem rust were so severe as to threaten the entire industry. Everyone connected was very much concerned and the milling

companies decided that something must be done. The grant they established at the University, while insufficient to meet expenses, nevertheless committed me to a single-objective program in soft wheat breeding. The objective was a variety with quality characters similar to those of Lemhi, but also a high degree of resistance. Using all possible means of speeding the work along it was possible to produce a variety from the first cross to 45,000 bushels of seed in eight years, faster, I believe, than was the production of any new varieties. It must be admitted that while acceptable to the milling companies it does not have quite the quality of Lemhi, but it is also earlier, and shorter and stronger strawed. It can be safely estimated that increased yield alone could account for an increase to the farmers of some \$50,000.00 to \$80,000.00 annually. In a rust year the saving could be closer to 1/2 to 3/4 million dollars. The cost of developing this variety is approximately \$50,000.00.

What was done in soft wheat is equally possible in other specialty crops. I submit that in the case of market garden and specialty crops grown especially in southern Alberta we hardly know what the potentials are. Up to the present, production comes from varieties having some suitability but no concentrated attempts have so far been undertaken to develop varieties especially adapted for the conditions existing in the production areas.

#### 4. Special Problems in New Areas.

I hesitate to say much on this point, because the problems become apparent after settlement has occurred. The experience generally has been that settlers must suffer for some time before administration is willing to evaluate the situation prior to doing something about it. The situation again can be illustrated by example. The Fort Vermilion area has had a concentrated flax production. Aside from the economic advantage of growing a high price commodity the area is suited to producing flax of high quality provided the crop is not frozen. This means an early variety. Redwing has been most satisfactory, but it is susceptible to rust. Plant pathologists had warned that continuous and concentrated production with a susceptible variety would lead to trouble. It did. We have resistant varieties but none that also has quite the yield and earliness of Redwing. Here there has been failure in that suitable breeding programs were not developed for this situation. There should have been available quite some time ago a variety of flax for this area suitable and with resistance to rust.

I believe the foregoing is sufficient to indicate the importance of plant breeding in overcoming production problems. There is no doubt that as new principles and procedures are developed breeders will become more and more efficient. It is well to emphasize

again, however, that in order to establish clear-cut objectives for a breeding program in any crop, the critical problems be clearly understood. This can best be done if the breeder keeps closely in touch with the producer but also especially with those concerned with problems of the soil.

In the development of new areas much can be gained by breeders and land appraisers keeping each other mutually informed. Those charged with evaluating new areas will certainly go far astray if they are not aware of what plant breeding has done and can do. We do not need any more Pallisers, in other words. Plant breeders likewise need to know what the problems in new areas are likely to be so that they can take stock of what they already have and in which direction their work should go.

I hope I have not left the impression that we plant breeders have all the solutions to all the problems. Undoubtedly, the benefits of the most suitable varieties are not fully realized unless good cropping practices are followed. But it is also true that the limits of what can be done with a crop are set by the genetic makeup of the varieties, and juggling of this genetic makeup has brought and will continue to bring great benefits to the human race.

To us in Alberta there is a special challenge. The land that is still potentially agricultural land will be an irresistible lure to people with pioneer spirit. There will be problems to be solved that will challenge the spirit and intellect of the breeder to the utmost. I wish to submit that only a well organized and supported program of study and research will enable us to develop these new areas fully. When I say research I mean all aspects having to do with production, transportation and marketing.

But let me before I close come briefly directly to the question - is there enough breeding work to overcome existing and potential future problems? The answer, in my opinion, is that with some crops and their problems the situation is not too unsatisfactory. At least we have some breeders working on well defined objectives in individual crops. In other crops there is not even the semblance of a program. In the forage crops generally, in specialty crops and in breeding to overcome special problems in new areas the programs, if there are any, are woefully inadequate. In the area from Lethbridge north we have one man breeding alfalfa. The improvement of red clover is one of many duties of one individual working at Lacombe. No one is breeding grasses for northern areas. To date it has not been possible to get a plant breeder to work on the cereal production problems of the truly northern areas. True, the development of earlier varieties is the objective of the Co-op programs sponsored by the Federal Experimental Stations at Lacombe and Beaverlodge and the University, but I submit that progress will be unduly slow until we get to the situation where a single breeder can give concentrated attention to one, or at most, two main problems in a single crop.

## QUESTIONS

QUESTION: With only a limited group of agrologists available, is the percentage occupied in research and extension the right. If not, what should be the trend?

ANSWER: This is a biased answer given from the standpoint that, as has already been said, if we were to apply all of the information that we already know, we would be able to raise production by 70%. Example: It is something similar to a very modern building with taps in certain places but no lines connected. In other words, if there is any imbalance at the present time we may have a number of taps that are not connected and the reason is because there are not enough available. The trend should be the other way. We should have more research information available so we do not have to build up extension at the expense of research. There should be a salesmanship programme or building programme.

QUESTION: Would you consider Sangaste rye to be suitable for the Camrose north-east district?

ANSWER: Yes, it would be. The information we have available is that its area of maximum suitability is that area south of Edmonton and also north of Edmonton. The north-east Camrose district would be very suitable for this type of rye.

QUESTION: What are the possibilities of developing a "duck" resistant variety of grain! - or what has been done to develop early-ripening varieties to avoid depredation by waterfowl?

ANSWER: You could try to develop a different variety of duck - - - (applause), or start seeding earlier, but then of course, they would only start feeding earlier, (laughter).

## "THE UTILIZATION OF GRAZING RESOURCES"

ALEX JOHNSON  
Range Specialist,  
Lethbridge Research Station

### Historical

According to geological evidence, the grasslands of Alberta came into being during the Miocene epoch of 25 million years ago. Prior to this, a temperate forest had covered the Plains. With the uplifting of the Rocky Mountains, the warm, moisture-laden winds from the Pacific were cut off and a climate much like our present climate resulted. This caused a dying off and displacement of trees and increase in the more drought-tolerant grasses. As prairie species became more diversified and the grasslands more widespread, there was a great increase in the kinds and numbers of grazing animals. Camels, elephants, primitive horses, buffalo, and rhinoceros all roamed the plains and fed on the grasses and other vegetation. Our grasslands, therefore, evolved under a grazing co-action and present species have an inherent resistance to at least moderate grazing pressure.

It is obvious that no new influence was exerted on our rangelands with the coming of domestic livestock. Grazing animals had always been present, although probably in lesser numbers, and it is likely that these occasionally caused localized, or even general, misuse and overuse of the range.

### Introduction of Livestock

Horses were the first domestic livestock to enter what is now Alberta. These animals were obtained by the Blackfeet Indians about 1730 and were probably acquired through trade from the Nez Perce to the south and west. Strangely enough, the numbers of horses in the hands of the Blackfeet Indians were never very great in their nomadic days and probably did not exceed an average of one horse per person. After the Indians settled on reservations, horse numbers grew rapidly and by 1900 there was an average of about ten horses per person.

Cattle, in small numbers, started coming into Alberta about the middle of the nineteenth century and by the mid-1860's were present at Fort Edmonton and at the mission at Morley. However, no large scale ranching was possible in Alberta until the danger from marauding Indians had been eliminated and the herds of buffalo, in particular, had been killed off. In Canada this coincided with the coming of the Northwest Mounted Police in 1873. With the arrival of the Police, forts were set up, law and order was established, and by

1877 the Blackfoot tribe had agreed to go on reservations. The year of 1877 is usually considered as marking the beginning of cattle ranching in southern Alberta. At that time, Fred Kanouse of Fort Macleod acquired 21 cows and a bull in payment for a debt and being unable to sell them, turned the herd loose to over-winter as best they could. To the surprise of everyone, they were picked up the following spring in good shape, and people realized for the first time that domestic cattle could exist on prairie grasses in the colder months. Soon, herds of three and four thousand head began moving in from Montana and this movement, with the purchases from other areas, resulted in the rapid stocking of Alberta ranges.

The build-up continued although it was not until 1919 that the last of the open range on the North American continent - the C.P.R. Block south of Bassano - was occupied. The fact that Alberta rangelands were the last to be occupied has a bearing on the present condition of our grassland. We are in the position of simply not having had as much time as many others to abuse our rangelands through a lack of knowledge and this is borne out in any general comparison of our ranges with those of many other parts of North America.

There were difficult times in the early days of ranching - experiences that have left their mark on present day management. The first occurred during the winter of 1886-87 when severe cold, deep snow, and prairie fires, which had destroyed winter grazing, all combined to cause disasterous losses of livestock. The winter of 1906-07 was similar. These disasters impressed upon the ranchers the importance of adequate feed supplies and it is now common practice to maintain a feed reserve of at least one ton of hay for each animal unit over-wintered.

We learned something else during the historical period under discussion. The year 1880 marked the end of free range in Western Canada when the Federal Government of that day recognized an additional source of revenue. Leases were granted to a maximum of 100,000 acres and the lessee was expected to stock the lease at a rate of one head of cattle for each ten acres within three years of occupation. This proportion was to be maintained throughout the life of the lease. By 1888, it was recognized that this carrying capacity figure was unrealistic in view of the productive capability of the land and the number of acres per head was increased to 20, and later to 30, acres per head. In 1945, lease rental was placed on a sound basis by dividing the province into zones on the basis of expected production and assigning a carrying capacity figure based on this expected production. These figures are not fixed and may be adjusted to suit an individual ranch.

Thus, in 80 years, we have gone from the period of free range, through arbitrary assessment of carrying capacity, to the present system where cattle graze our rangelands on the basis of known production of grass. It is probable that, as time goes on and our knowledge increases, minor changes will continue to be made in the carrying capacity figures.

## The Present

Moderate Grazing. We have stated that present carrying capacity figures are based on the known productive ability of the range. In actual practice it is not this simple for the individual rancher. Unlike hay and grain, range forage cannot be used in its entirety. When a haystack is gone, the rancher knows he must provide other forage. When the harvestable portion of a range is gone, however, there is a residue which must be left if the range is to remain in good, productive condition. Consequently, if forced by an economic emergency, drought, or even by greed or ignorance on the part of the manager, livestock can survive for a long time in apparent good health on the residue. This is shown by results of experiments at the Range Experiment Substation, Stavely, where deliberate over-grazing has given the highest per acre production of animal products to date. It should be stressed that this production has been obtained at the expense of the vegetation and can be expected for a limited time only.

Table I. TOTAL PRODUCTION PER ACRE IN POUNDS. STAVELY. 1951-1958.

Grazing Treatment	Production Per Acre	
	1958	1951-58
Light	42.2	39.2
Moderate	55.0	55.0
Heavy	74.1	75.3
Very Heavy	117.9	112.7

This period appears to be about five or six years in the shortgrass area and eight to ten years in the foothills.

Another way of illustrating the importance of a moderate rate of grazing is to look at an individual range plant. Four such plants, grown for a five-month period from equal sods, subjected to different clipping treatments are shown in Figure 1. It will be seen that as the intensity of clipping increases, the relative amounts of both top growth and root growth decrease. The same thing happens when the clipping is done by the grazing animal. The reason for the differences shown hinges on the fact that all food utilized by the plant is manufactured in the leaves. Under normal use, some of this food is used for growth while a portion is stored in the roots to be used during dormant periods and for spring growth. If the leaves are continually removed through grazing or clipping, these processes cannot go on and the plant depends, in large measure, on stored food. When this stored food is exhausted, the plant dies.



Figure 1. Plants of rough fescue grown for a five-month period from equal sods and clipped as follows (from left to right): check, clipped to 5 inches at 4-week intervals, clipped to 3 inches at 4-week intervals, and clipped to  $1\frac{1}{2}$  inches at 4-week intervals.

It is unfortunate that no really accurate measuring stick exists for determining full range use. The suggestion is often made that one should "Graze half, leave half, and harvest the biggest half". Another rough measure of full range use is to ensure that about 20 per cent of the seed heads produced are left after grazing is completed. By and large, however, good judgement on the part of the experienced manager is the best practical measure.

Reseeding. We have discussed moderate grazing and have mentioned some of the evils of over-use. It might be well at this point to briefly discuss reseeding and other aspects of cultivated forage crops.

These have become part of our grassland complex. We know that cultivated grasses, especially if grown in admixture with alfalfa, will invariably out-yield native range regardless of the area. The question immediately comes to mind, "Why not break up our native ranges and seed them down to cultivated grasses?". On the surface it would appear to be the thing to do and, should population pressure dictate such a step, may eventually happen. In the meantime, however, it is well to remember that our native grasses are well suited by reason of their grazing resistance, quality, and abundance to be used as the basis of a ranch operation. Range reseeding is expensive and in no way a substitute for good range management. Failures in establishing a stand have occurred and will occur again. Further, there are limitations to the life of a cultivated forage crop stand. Our native ranges, on the other hand, have been yielding well for thousands of years and will continue to do so for thousands more assuming good management. In general, once reseeding has been started it, or some other type of expensive pasture renovation, becomes a continuing part of management.

Reseeding does have a place. Cultivated forages can be grazed in the early spring or fall and thus take the pressure off native ranges at critical periods. They are useful in extending the length of the grazing season. In our northern areas, cultivated forage crops will probably make up an important part of a ranch operation. They are essential in providing high yields of good quality hay.

Multiple Use. When thinking of the utilization of our grasslands it would be a mistake to consider grazing by domestic livestock only. Other uses are important, and in some cases may be more important. This is particularly true of the Forest Reserves which are located along the eastern slope of the Rocky Mountains. This is the watershed of Western Canada and its most valuable product is the water it yields. For example, it is estimated that about 80 per cent of the flow in the Saskatchewan River system comes from the 16 per cent of the land area that make up our Forest Reserves. This provides the water for 84.6 per cent of the population of Alberta, for 42 per cent of the population of Saskatchewan, and 2.2 per cent of the population of Manitoba. These waters are of prime importance in the irrigation of some 800,000 acres in southern Alberta, and in the proposed irrigation of large tracts of land in southern Saskatchewan. They are essential in any future industrial development - it requires 45,000 gallons of water to process a ton of pulp, for example.

Secondly, the recreational needs of our population must be considered and, with a gradually shortening work week, will become more and more important. This means that consideration should be given to the requirements of fish and of game animals, the latter including elk, deer, and antelope. Fortunately, elk are the only one of this group which present much of a problem in their competition with livestock and this problem is localized along, and within, the mountainous areas. Deer and antelope, in general, don't eat the same type of forage

as that consumed by cattle and are usually not an important factor in grassland utilization. At the present time, some organizations throughout the province are working actively toward the creation of wilderness areas where recreation will be the major land use.

Lumbering may be important and can be a factor in grassland utilization should officials decide to re-forest grassy clearings by planting trees. This has not been a consideration in Alberta to date but has caused some concern to ranchers in southeastern British Columbia. On the other hand, the removal of trees often results in the creation of areas which can be utilized by livestock for a comparatively long time.

As a general rule, these other land uses are compatible with the grazing of domestic livestock on a moderate basis.

Other Problems. A problem of our grasslands is that of poisonous plants. Many species are known to be poisonous although four or five account for most of the losses. There are treatments available for most cases of poisoning although, under practical ranch conditions, about all that can be done is to know the species on ones own area, to avoid them if possible, and to eradicate them if practicable. With the exception of larkspur, most of these plants are not readily eaten by livestock unless the animals are being driven, are hungry, or lack some essential element such as salt.

Brush control is a matter of concern in some areas. Clipping studies have shown that the production of usable forage under a dense stand of poplar, for example, may be only a fraction of that on open grassland. Again about five types of shrubs and trees cause most concern. In general, this is an economic, rather than a biological problem. Methods have been developed whereby these brushy species can be controlled although most are fairly expensive.

#### The Future.

There is little doubt that we will see an increasing demand for beef in Canada. In one study, it is anticipated that by 1970 the population of Canada will be about 21,500,000 and that we will witness a 39% increase in disposable income. At least a portion of this will go toward the purchase of meats and other more expensive foods, with a smaller proportion of cereals and potatoes. This will result in a 60% increase in the demand for beef and it is further felt that two-thirds of the Canadian cattle production will be confined to the Prairie Provinces. Where, then, is Alberta's share of this increased population to be obtained?

In speaking of the Prairies as a whole, it is an interesting fact that the total livestock load on the grasslands has not increased since 1920. The increase in cattle numbers during the intervening period has been accompanied by a decrease in numbers of horses

and sheep. With present management practices, then, further increases must be obtained by bringing new lands into production. Fortunately, grazing of livestock is possible on lands which are not presently being utilized. W.R. Hanson has reported that four to five hundred thousand acres of potential grazing lands are located in the Clearwater area of west-central Alberta. This can become available on a summer use basis as demand dictates. There is an unknown, although probably limited, potential along the Peace River and tributary valleys to Fort Vermilion and in the Caribou Hills of extreme northeastern Alberta. There is a large potential in the area north and west of Edmonton on the grey-wooded soils which now support a variable stand of trees.



Figure 2. Distribution of beef cattle in Alberta in 1951. Each dot represents 500 head.

Expansion into these areas will not be done without difficulty. Most of these areas are in the north and it is a fact that range quality decreases from south to north. The growing season, hence the grazing season, is short and the winter feeding period correspondingly long. Land clearing may be necessary with its attendant expense. Soils are generally not as fertile as those on the open plains and will require management practices that involve crop rotation and the use of fertilizers. In the extreme north, yearly precipitation is only 12 to 14 inches and it is likely that large acreages will be required per animal. Biting insects - mosquitoes, bulldogs, black flies - will undoubtedly cause trouble and may limit immediate expansion into some of our northern areas. The use of cultivated forage crops for spring and fall grazing and for winter feed will be an important part of management. Luckily, Canadian grown cattle seem sufficiently winter hardy for use in our northern areas.

A further alternative in supplying the needed pasturage is to plant cultivated grasses and legumes. There were nearly two million acres of cultivated hayland in Alberta in 1958 yielding an average of 1.2 tons per acre and this is likely to increase. We now have a good knowledge of species adaptation, of cultural practices involved in stand establishment, of hay and seed production, and of fertilizer practices. We know something about the management of cultivated forage crops when used as pasture although more information is needed. There are improved varieties of many adapted species available.

We are witnessing an increase in the acreage devoted to irrigation and there is little doubt that livestock production will be an important part of the irrigated economy. In southern Alberta we have already reached the point where 500 pounds of beef per acre can be produced on irrigated pastures. This figure is in striking contrast to the 40 or 50 pounds per acre that is being produced on our best rangeland. It seems likely that the livestock used on our irrigated lands will have to be grown on relatively cheap lands with rapid gains being put on mature animals using irrigated pasture.

Finally, in the United States it has been estimated that a 35 per cent increase in the productive capacity of rangeland and a 70 per cent increase in hay and cultivated pasture land is possible by applying present knowledge. Canadian figures are probably similar. As an example, although much of Alberta's land area will respond to fertilizers only 6 pounds of fertilizer per cropped acre were used in 1958. Thus, more intensive use of existing areas is possible. Cattle are now being selected on the basis of their performance rather than on the basis of their appearance and this will gradually result in an animal that can use feed more efficiently. Management practices can, and will be improved.

In summary, then, there is a grazing potential that is not presently being utilized. However, in the immediate future, it is likely that increased production of animal products will come about as a result of more intensive, and more intelligent use of the present areas.

## QUESTIONS

QUESTION: Is brush control by 2-4-D feasible on range areas?

ANSWER: It is technically feasible whether or not it is economically feasible. It depends on individuals. Those few which are resistant to 2-4-D-can be controlled by 2-4-5-T. P.F.R.A. in Saskatchewan feel that aerial spraying would run around \$3.00 to \$4.00 per acre. Last summer it cost an operator up to \$1.00 per acre.

QUESTION: What methods are being used by your Department to create an awareness of the principles and practices of range management among the farmers and ranchers in this Province?

ANSWER: This gives me an excellent opportunity to put a plug in for the American Society of Range Management. We do attempt to turn out weekly letters, press releases and radio talks all designed to acquaint the public with the principles of the practice.

QUESTION: Is there any proof that cattle with Brahma blood is more resistant to insect pests? If so, such cattle might be more adaptable to northern areas.

ANSWER: I am not too familiar with the characteristics of the Brahma blood, but off hand I would say they are not any more resistant to pests. They are a heat loving animal and in my personal opinion I doubt that cattle with Brahma blood would be too much use in Northern areas.

QUESTION: Due to Strip Mine operation on head waters of Glacier Creek which flows into Crowsnest Lake serious erosion of overburden and waste coal is carried down into the lake. What is being done to prevent this displacement of water?

ANSWER: . . I cannot answer this question in detail, but I do know that the personnel of the Eastern Forest Conservation Board are conscious of this problem. It is a problem of their area. I am certainly not too familiar with what they are doing about it.



## "UTILIZATION OF PUBLIC LANDS IN ALBERTA"

V. A. WOOD  
Director of Lands  
Department of Lands and Forests

In this paper it is proposed to discuss the land policies of the Hudson's Bay Company between 1670 and 1870, the dominion government between 1870 and 1930, the provincial government since 1930 and to show the objectives and the problems in land utilization which arose during their respective administrations. It is proposed to limit the discussion to public lands which are used for agricultural purposes. It is felt that such a discussion is necessary in order to formulate a suitable land policy for the management of the public land resources of the province which are available for settlement.

### Amount of Public Land in Alberta

In 1870, Rupert's land which included the area that is now known as Alberta, was surrendered to the Dominion of Canada by the Hudson's Bay Company. At this time there was virtually no settlement in this area and all of the land, except for that held by the Hudson's Bay Company as trading posts, came under the control of the Dominion of Canada. The following table shows that since 1870 approximately 35% of the area of the province has been disposed of to private ownership, which means that approximately 65% of the land area of the province is still public land. Of this area about 11% is held by the federal government as national parks, Indian reserves, military areas, etc. This leaves the province still in control of over 50% of the land area of the province. However from the surveys made it is known that much of this area is not suitable for settlement.

### Land Policy Objectives

Simply stated, the objective of a public land policy should be to allocate and use public land that has been classified as agricultural land, in such a way that it will help to establish farm units capable of giving sufficient returns to the factors of production and which will allow a stable pattern of land use under conditions, which, according to present knowledge, are expected to exist in the future.

To attain this broad objective of proper land use it is considered that the following specific objectives should be met:

1. In the allocation and use of public land to prevent any undesirable soil deterioration. This means that to maintain production it is necessary that the soil itself be maintained and

DISPOSITION OF LAND IN ALBERTA (1)

	<u>sq. miles</u>	<u>percentage</u>
1. Privately owned land or land in process of alienation from the Crown. (2)	89,320	34.99
2. Federal lands other than leased lands, National Parks, Indian reserves and forest experiment stations.	5,446	2.13
3. National Parks. (3)	20,717	8.12
4. Indian Reserves	2,416	.95
5. Federal forest experiment stations	47	.02
6. Provincial lands other than Provincial Parks and lands in Eastern Rockies Conservation area	126,401	49.51
7. Provincial Parks	170	.06
8. Wilderness Provincial Park	2,149	.84
9. Eastern Rockies Forest Conservation area	<u>8,619</u>	<u>3.38</u>
Totals	<u><u>255,285</u></u>	<u><u>100.00</u></u>

(1) From Canada Year Book and Provincial Government Sources.

(2) This includes some Provincial land under sale, homestead lease and homestead sale.

(3) Includes Wood Buffalo Park, an area of 13,675 sq. miles.

(4) The province has approximately 14,600 sq. miles, or approximately 9,000,000 acres under sale and the various types of leases, licenses, permits, etc. The lands under homestead lease and homestead sale are included in Item 1.

not lost through water erosion, wind erosion, etc. Such a loss of soil would be a permanent loss of capital and would permanently reduce the ability of the land to produce future crops.

2. To strive towards maximum net returns in the use of public lands. In order to accomplish this it is necessary that the lands be used as efficiently as possible and in accordance with principles of good management.

3. To allocate the land resources in the size of a farm unit that will make it possible for the operator to attain a satisfactory level of living and to achieve efficient production.

For social and political reasons it is expedient to establish a maximum size unit in order that operators may be allowed to use their initiative to expand but at the same time to prevent an operator from acquiring too large an area of public land.

4. To adopt a type of land tenure that will assist in granting freedom, equality and security to all who hold rights in land and which will assist in the realization of the first and second objectives.

Having set forth the objectives it is proposed to review past and present land policies of Alberta and to show briefly some of the effects and problems of these land policies.

#### Hudson's Bay Company Administration - 1670 - 1870

Strange as it may seem western Canada, including Alberta, was under the administration of the Hudson's Bay Company from 1670 - 1870, a period of 200 years, while the dominion and provincial administration covers a period of only 90 years.

On May 2nd, 1670, King Charles II granted the Governor and Company of Adventurers of England (Hudson's Bay Company) not only the right to trade but absolute territorial rights to colonize and govern the area of Rupert's land, which included what is now the Provinces of Manitoba, Saskatchewan, Alberta, the Northwest Territories, Yukon Territory and part of the Provinces of British Columbia and Ontario.

That the company was successful in establishing fur trade is a well known fact and has little if any bearing on a discussion of land policy. Since the main purpose of the Hudson's Bay Company was fur trading rather than colonization, the latter could only be fostered to the detriment of the former. It is easy to understand, therefore, that the company not only discouraged colonization and land settlement but in many cases took active measures to

prevent it. The only exception was in 1812, when Lord Selkirk, a shareholder in the Hudson's Bay Company, was given a grant of land in the vicinity of the present city of Winnipeg, for the settling of 1,000 families during a period of 10 years. The colony had many difficulties, of which transportation to a market was one of the greatest and by 1870, when the Hudson's Bay Company surrendered Rupert's land to the newly formed Dominion of Canada, there were fewer than 1,000 white people in the settlement.

#### Dominion Government Administration

At the time of the transfer of Rupert's land the Dominion Government found itself in control of a vast uninhabited territory which included what are now the Provinces of Alberta, Saskatchewan and Manitoba. The Dominion Government was obligated to build a railroad to British Columbia and furthermore in 1870 the Dominion Government was faced with the problem of carrying out the terms of surrender made with the Hudson's Bay Company which included granting 1/20 of the land located in the fertile belt of western Canada to the Hudson's Bay Company. For the foregoing reasons in 1870 the Dominion Government retained the natural resources for, as quoted "the purposes of the Dominion". These purposes in 1870 were three-fold:

1. To promote rapid settlement in this large territory in order to consolidate the new Dominion of Canada and discourage the territorial ambitions of the United States.
2. To encourage the building of railways, through land grants.
3. To carry out the terms of the agreement with the Hudson's Bay Company. By 1900 the threat of an invasion from the United States had passed, but by this time the Dominion had still another purpose for promoting rapid settlement of the Western Territory. This purpose was expressed in the House of Commons by the Honourable Clifford Sifton, Minister of the Interior, in 1903, when he stated in part as follows, "I want the House to understand the policy which this Government is following. It is endeavoring to build up a consuming and producing population in our vast Western Territory for the purpose of giving legitimate occupation, without excessive duties, on a legitimate business basis to the mechanics and artisans in eastern Canada."

Thus the purposes of the Dominion in retaining the natural resources were both political and economic. However, the economic purpose was not to settle the land according to its best use but to create a consuming public and supply a market for the eastern manufacturer.

In order to carry out the settlement of the lands in western Canada the federal government adopted the homestead policy

which at that time was based on the premise that every 160 acres, or with a pre-emption, every 320 acres of land in western Canada was an economic farm unit capable of supporting a farm family. Unfortunately this was often not true, due to the nature of the soil and climatic conditions in the areas settled, and due to the economic conditions and state-of-the-arts, as pertaining to agriculture, in existence at that time. This is evident by the fact that between 1905 and 1930 nearly 40 percent of the people obtaining homestead entries failed to obtain title.

The assumption that each unit of 160 or 320 acres was an economic farm unit also meant that all of the social services such as roads, schools, and even towns and villages were developed on the basis of one family per 160 or 320 acres. Taxation was on the expected productivity, with the inevitable result that many settlers lost their land by tax recovery proceedings and foreclosures by mortgage companies for unpaid debts. Finally, in some areas a readjustment had to be made of the whole structure of land valuation, taxation, social services, and land use. This readjustment in land use was one of the fundamental problems facing the province when the natural resources were transferred in 1930. In addition, Alberta still had available agricultural lands and the problem of developing an adequate land settlement policy had to be solved.

#### Dominion Government Grazing Policy

With the opening up of the western territory for settlement in 1870, many cattlemen became interested in the grazing possibilities of this area. To meet the demand for grazing rights the dominion government established grazing lease regulations in 1881 which provided for the granting of grazing leases on areas comprising up to 100,000 acres for a term of 21 years. At first the leases were granted without inspection of the lands and a lessee was required to stock the land at the rate of one head per 10 acres. This was later reduced to one head per 30 acres. A flat rate of rental was charged that varied occasionally with periods of prosperity and depression. Taxes were charged separately by the taxation authorities. During most of the dominion government's administration, grazing leases were considered as subordinate to the main purpose of land settlement; the lessee had little security of tenure, as the lands held under lease could be made available for homestead purposes at any time during the term of the lease.

The dominion government had various other forms of regulations for the disposition of land for specific purposes, but these did not affect the overall policy of land settlement. Except for school lands only a relatively few parcels of land were sold by the dominion government as this did not fit in with the policy of encouraging land settlement.

## Provincial Administration - 1930 - 1960

With the transfer of the natural resources to the province in 1930 all the land records and files required for the administration of the unalienated public lands were transferred to the province.

The main problem facing the provincial government in 1930 was the adjustment of the mistakes of land settlement under the dominion government administration. However for the first few years after the transfer of the natural resources from the dominion to the provincial government, the province continued to administer the lands under regulations similar to those of the dominion government. The homestead policy was continued with certain limitations to the granting of the homesteads in the southern part of the province, also the province followed a similar grazing policy to that of the dominion government. However toward the end of the depression years, that is in the late 1930's the defects of the homestead policy and the grazing policy began to pyramid. Much of the better land was already settled and it was more and more difficult to find a suitable quarter section of land. Many homesteaders were on relief and the province was responsible for their welfare. In the southeastern portion of the province thousands of acres of titled homestead lands reverted to the municipalities for non-payment of taxes. In many cases grazing rentals and taxes, which were levied on a flat rental basis, were badly in arrears. It was evident that the government needed a new land policy, especially with respect to land settlement and grazing leases.

In 1939 the granting of homesteads was discontinued and was replaced by an agricultural lease policy that was later known as the homestead lease policy. Under this policy leases were granted on areas up to 320 acres for twenty years and the lessee was permitted to purchase after completing five years of cultivation and residence duties. A one-eighth crop share was payable after the lessee held the land for three years.

To restrict settlement to those areas where social services are reasonably available, to reduce the danger of forest fires and to divide the forestry area from the settlement area the province in 1948 was divided into two zones, namely the land settlement zone and the non-settlement or forestry zone. In the non-settlement area all forms of land settlement are prohibited but persons are allowed to obtain rights for commercial purposes such as trapping, lumbering, mining, etc.

In the settlement zone before any disposition is made of Crown land and to insure that lands are disposed of according to their best use, a careful inspection is made and the lands are classified before disposition is made.

Since 1939 there have been many minor changes to the homestead lease policy, to lessen the residence and cultivation duties and to ease the crop share payments.

In 1957 a homestead sale policy was adopted. Under the homestead sale policy a person may acquire up to three quarter sections of land, title may be acquired after the purchaser has paid the sale account in full and has performed certain cultivation duties and held the sale for a period of not less than five years.

It is not the practice under the homestead lease or sale policy to screen or select applicants. Any person who meets the necessary qualifications as to age, citizenship and residence requirements and who does not own other land may apply for a homestead lease or sale.

Classifying the land before disposition is made and withholding lands not suitable for settlement helps to insure that as far as acquiring suitable land is concerned the applicant has a fair chance of success. Other factors such as personal characteristics, capital available, establishment of a proper farm management program, all of which influence a settler's chance of success or failure are not given very much consideration.

In 1955, in order to give some financial assistance a homestead lease loan policy was established. Under this policy a homestead lessee or purchaser, after having brought 35 acres under cultivation at his own expense, may apply for a loan up to \$1,000.00 for clearing and breaking.

#### Grazing Policy

In order to consolidate the administration of public lands under one department and in order to have a more uniform policy for public lands all tax recovery lands located in improvement districts and administered by the Department of Municipal Affairs were transferred to the Department of Lands and Forests for administration purposes in the early 1930's.

In 1945 a new grazing rental policy was adopted whereby the rental was based on a formula which took into consideration the carrying capacity of the land, the average price of cattle on the Calgary stock market and the average gain of cattle on grass. This new rental policy, together with the classification of the lands according to carrying capacity, was of considerable assistance in overcoming some of the problems which arose during the Dominion Government administration.

In addition to the land settlement policy as embodied in the homestead lease and sale regulations and the grazing policy

as embodied in the grazing lease regulations, the lands division disposes of public lands under various other forms of leases, licenses, annual permits and by sale. The regulations are designed to meet special forms of land disposition. Periodically, lands not considered suitable for a homestead lease and school lands in the settlement zone are offered for sale by public auction. No sale is made where it is considered the lands may be misused if title is issued; such as grazing lands in southeastern Alberta or where lands are covered with commercial timber, or other lands which, due to their location or physical characteristics, it is considered in the best interests of the government to retain title.

#### Problems which have Arisen out of the Past and Present Land Policy

From the foregoing discussion it is evident that the land policies both past, and, to some extent, the present were based on political and economic aims. However during the past twenty or thirty years the aims and objectives of the government, with respect to land policy have been changing and in recent years the attitude has been growing that fundamentally the government in administering public lands should be considered itself as a landlord. As a landlord it should try and obtain the greatest return from the land. The main difference of attitude between the government as a landlord and a private individual is a matter of time. The government must judge returns in terms of perpetuity. Primarily then the present objectives of the government are somewhat similar to those stated at the beginning of this discussion.

The following are some of the difficulties and problems which have arisen in meeting these objectives:

##### I. Land Classification

One of the main errors in the past in formulating land policy and in making disposition of public lands was the disregard of the physical characteristics of the soil. Today land classification is considered of first importance in establishing a land policy.

During the last twenty-five years it has been recognized that the physical characteristics of the land resources, which include the soil profile, precipitation, temperature and topography, determine the native plant and animal life which developed while the land was in its natural state. These characteristics in turn indicate and in fact set the limits of the possibilities for alternate uses which can be made of the soil. There are however two types of land classification, namely a physical classification which is based on the physical characteristics of the land resources and secondly a land use classification, which type of classification includes, in addition to the physical factors, the economic factors such as market accessibility, size and type of operating unit, location of roads, schools, power lines, price relationship and other related economic factors. These economic factors condition the use which man makes of the land.

At the present time the lands division makes adequate physical classification before any disposition is made but it may be argued that no adequate scientific type of land use classification is made due mainly to the difficulty of making such a classification. One of the biggest problems concerning the land policy administration is to determine proper land use after having obtained the physical classification of the land.

2. After having decided on a particular type of land use it is necessary to determine the size of unit in which it should be allocated and under what form of tenure. The size of unit is of particular significance in the land settlement policy and the grazing policy. There is much evidence that farm units are increasing in size and that the smaller units cannot be developed into economic farm units. In relation to the homestead policy many claim that the one-half or three-quarter section sized units are not of sufficient area to enable a person to develop a satisfactory unit.

In relation to grazing, in 1959 the maximum area of a unit was reduced from that sufficient to graze 1,000 head to that sufficient to graze 600 head. While a unit sufficient to graze 600 head is considered an optimum sized unit from the standpoint of efficiency, there are many who claim that it would be more desirable to have smaller units and more of them. This brings up the problem which often confronts the government, that is of sacrificing efficiency in order to assist more farmers.

### 3. Land Tenure

In general the government has adopted the policy of disposing of land by public auction sale, homestead lease, homestead sale, all of which lead to private ownership where the land classification indicates that such land under private ownership will not necessarily become permanently damaged, where the land is in the settlement area, where the land is not required for watershed protection, such as in the East Slope area or where it is considered that the land will not become a problem through misuse, such as using land for cultivation in the southeastern area of the province where the land is classified as only suitable for grazing. In general this policy is favourably accepted, however in regard to grazing lands in southern Alberta it is claimed by many that by operating larger units and by using modern machinery and adopting modern farm practices much of the land presently classified as suitable for grazing could be successfully farmed over a long period of time.

Under the present grazing policy where the title is withheld and the land is allocated under long term grazing lease there are many problems in the administration of the lands such as security of tenure, equitable rental and taxes, development and ownership of improvements, etc. Some claim that the grazing lands would be more

efficiently utilized under private ownership but agree that they should be sold with some form of caveat or encumbrance, preventing them from being cultivated.

4. The present policy of the government is to sell lands by auction and in the case of a lease to dispose of the land by tender or by holding a draw on a first come, first served, basis. Some claim that screening and selection of applicants would be a better policy. In theory this may be true but in practice it presents many administrative difficulties.

5. As the province is being more industrialized and urbanized the demand for the use of land for different purposes is increasing. This brings up the problem of multiple use of land and how to permit the land to be used for several different purposes at the same time and to protect the right of the various users.

For example land may be leased for grazing and the grazing lessee is the primary user. However there may be commercial timber on the same land, there may be an oil well drilled on the land and the land may be crossed with several pipelines, power lines, easements, etc. Also there may even be commercial deposits of gravel. All of these varying interests must be met and considered if the land is put to its best use.

6. As the province is becoming more urbanized and increasing in population there is a greater demand for land for recreational purposes. In this regard the government has the problem and responsibility of reserving and setting aside what is needed for public recreation and to insure that as far as possible future generations will also be protected and will be assured of adequate public areas for recreation.

In conclusion it may be stated that a land policy is never static. It must be designed on broad general principles with a definite aim or goal in mind of proper or best land use. To achieve this goal it must be sufficiently flexible to adjust to advancements made in our scientific and technological knowledge and to changes in our social and economic structure.

## QUESTIONS

QUESTION: What is the present state or progress of lakeshore land inventory?

ANSWER: Last year the province started an inventory of all lake areas, chiefly in the northern part of the province. Part of the inventory was completed last year in the Edmonton area. After making the inventory, if there was any possibility of recreation development we reserved lands for further development for recreational purposes.

QUESTION: In view of increasing wildlife values should some Crown lands be reserved from conflicting agricultural uses and held as wildlife use areas?

ANSWER: We do have conflicting uses of land. Land can be used for many purposes. We find at the present time that land can be reserved for one particular use. In some areas it has been done. Land is reserved in many areas throughout the province for recreation and preservation of wildlife. All park areas are used for this. However no land is set aside exclusively for wildlife.

QUESTION: Please explain Homestead Sales Plan adopted in 1957.

ANSWER: In 1957 we adopted the Homestead Sales Plan. A person must acquire three quarter sections of land classified as suitable for agricultural development. He is then given the purchase price. He is required to hold the land for five years before he can get his title, and after he pays off the loan he can get title. Any person can apply for such Homestead Sales Plan if he has been a resident of the province for the last two years, doesn't own any other land, is over twenty-one years of age and a Canadian citizen. There is a bulletin available with further information. (Apply Department of Lands and Forests)

QUESTION: Who would be responsible for the loss of livestock due to forest fire in the forest reserve.

ANSWER: I don't know. I don't believe that the Department is responsible for the loss of stock. I think the person that lost the stock would have to suffer the loss himself.

Answer from audience: - No, the Department is not responsible.



## "PRINCIPLES OF RURAL AND TOWN PLANNING"

NORMAN GIFFEN  
Technician  
Edmonton District Planning Commission

As a way of introduction to my subject I should like first to describe the Edmonton District Planning Commission and its reason for being. Its purpose is to bring together those municipalities with common or related planning problems so that mutually satisfactory solutions may be worked out.

The Commission consists of the City of Edmonton, four rural municipalities, nine towns, three villages and representatives of the Provincial Departments of Highways, Agriculture and Education. The Municipalities are represented by their elected Councillors. Up until 1957 the Commission was a purely advisory body. Since then, it has, under the Town and Rural Planning Act and at the request of the member municipalities been given District Zoning powers and the task of preparing a district plan.

1. Any sound policy of land use and development is dependent ultimately on a public awareness and acceptance of the fact that land is a unique resource. That it is the platform of all human activity, that it is limited in quantity, that its manner of use generates private and municipal costs, that many uses or subdivisions once established may be difficult or impossible to change and may have enduring effects; the good, as well as the bad, remain with us.
2. District Planning must take into account both urban and rural land use. Because urban development generates the greatest changes, we might consider it first. To take the land needs of the Edmonton area as an example:
3. With a population growth of from 16,000 to 18,000 a year, the land needs of the metropolitan area have been approximately as follows:

for general urban uses -	
(housing, schools, local parks, local shopping)	1200 acres per year
light and heavy industry	200 to 400 acres per year

Depending on policy, these needs can be met by an orderly sequence of development involving economical extension of roads, utilities and services, or it can be met by scattered and fragmented development, which is costly in terms of roads, utilities and services, which uses more land than is necessary and which is detrimental to the fullest use of adjoining and intervening land. The Municipalities in this area are convinced of the soundness of an orderly sequence of development and it has been accepted as policy in the metropolitan area. There are many benefits flowing from such a policy and land conservation is one of them.

The acceptance of such a policy is based in part on the lessons from past eras of rapid expansion. There still remain in this area, two to three miles beyond city limits, the results of the massive subdivisions from 1908 to 1912. Parcels ranging from 33 foot lots to 5 to 20 acre blocks in all cases subdivided without concern for their use within a reasonable period of time, without concern for an economical utility or road system or the provision of land for school or park. In some cases, intermittently developed, these areas have not adequately used the land for urban or rural purposes, and many years later, when compact development becomes possible, their inadequate lay-out, odd shaped parcels make the best use of the land difficult and costly. The avoidance of this error can and is saving enormous amounts of land and results in a sounder use of municipal finances.

To consider further the question of urban expansion, one must take into account the host of urban or semi-urban uses in rural municipalities. The impact of a growing metropolitan area makes itself felt over a very large area. Some of these uses might be mentioned: primary industries, disposal grounds, reservoirs, cemeteries, trailer camps, drive-in theatres, sewage lagoons, major metropolitan parks, institutional buildings, airports, military installations. There is a substantial increase in such uses as small-holdings and country estates. There is also

an increase in other developments which are affecting the present and may greatly affect the future use of land, such as, power lines, pipe lines, gravel workings, and the black soil removal for urban gardens. There are pressures for subdivision for no particular use, for investment purposes, often into parcel sizes unsuitable either for urban or rural use.

Time does not permit a detailed discussion of the needs, requirements and effects of these various uses, but if we are not to waste land, or store up enormous future expenditures or adversely affect the future standards of development, the agencies involved in decisions must regard land as a resource and consider the long and short-term use. Some of these developments, if placed in the path of urban expansion, will merely involve undoing tomorrow what we have done today; certainly such things as gravel workings and disposal grounds should automatically carry out reclamation on completion of the working; certainly pipe lines and power lines should consider the subsequent use of land.

However, just as these many uses are occurring around our major cities, so on a smaller scale are they occurring around our growing District Towns, and the process of urbanization will continue and accelerate, and the wisdom of sound land use policies will become increasingly apparent and will pay enormous dividends, both in terms of finance and a more habitable environment.

Before dealing with those aspects of rural land use which concern a planning Commission, I would like to touch on the question of metropolitan parkland. It is, I think, extremely important that those areas of natural beauty in or close to our urban areas be acquired and reserved at an early date. The necessity for

these natural park areas close in to the urban centres will become increasingly valuable as the population increases. However, as the urban area expands land costs rise, and if development is once established in these areas it may make acquisition prohibitive. In most cases, there are one or two of these areas and, once lost, they cannot be recovered or duplicated. A municipal or provincial policy placing a high priority on acquiring these key areas will result in untold benefits for untold generations. The Whitemud Park proposal in Metropolitan Edmonton is one such area.

In dealing with rural land use in the Edmonton District I should like to elaborate, firstly, upon those uses which are semi-rural in nature; these for the most part are precipitated by the pressures of the large urban area which constitutes Metropolitan Edmonton.

The rural municipalities within our Commission are unique. Their problems of administration are much different from the great majority of all other rural municipalities in the Province of Alberta. They cannot be considered completely rural and to compare them with the more isolated and truly rural municipalities is unfair. For example, consider the problem of small holdings. These are parcels which range in size from 3 acres to 20 acres. There is a continuing real and speculative demand for this type of parcel. A fair number of City people have a yearning to live in the country. The Veterans' Land Act has increased this demand because of the small holdings rehabilitation scheme for Veterans'. Small parcel subdivision is common to all of the rural municipalities. The problems which arise in controlling these are of mutual interest. The Edmonton District Planning Commission set up a special committee to study the problem. In 1954, a report was issued and since that time it has served as a basis for the policy established within the Commission. The individual municipality examines the proposals for this type of development on the basis of the standards set out in this report. Such problems as weed control, road construction and schooling have to be weighed to determine whether it is economically advisable for the municipality to allow the subdivision. One of the major problems in dealing with small holdings is the consideration of a minimum size of parcel. The definition of a small holding requires that the holder have a sufficient area of arable land to enable him to augment his normal living by using his land agriculturally. Since under our present economic conditions this is not necessary or even plausible there is a demand for smaller parcels. There is considerable concern because of the invasion of these residential properties into the farm land. Generally, the municipal councils are faced with a disproportionate number of requests and complaints where these parcels predominate. Problems with road maintenance and drainage become increasingly more difficult to solve. Schools become overcrowded, necessitating the enlargement of school plants. This is immediately reflected in a larger school requisition. Also, because the parcels are not being used agriculturally they generally degenerate into a weed patch thus becoming a

problem for the Agricultural Service Board. The Commission staff is now completing a survey of all small holdings analysing the effects of the present policy and it is hoped that recommendations may be made which will meet the complex demands.

I have already indicated that there is a demand for smaller parcels than 3 acres in size. Our planning meets this demand by considering a category of country estate parcels which do not have to be on good agricultural land or have a minimum area of arable land, but must be located in areas which have scenic qualities in keeping with this type of development. Of course, the same problems exist with country estates as with small holdings.

Another feature of land use planning is the consideration of development along the highways which cut through our rural municipalities. These highways are subject to an ever increasing load of traffic, and with the expansion of Edmonton the pressures are very strong for development along these entrances to the City. In order to protect the highways and to keep them safe and efficient for the primary function of carrying traffic, the Commission and all of its' member municipal councils have adopted the preliminary District Plan for Highway Commercial Development.

This plan is based upon three principles:

- 1) That only services essential to or dependent upon, highway traffic should be permitted; these include service stations, garages, tourist camps, motels, roadside restaurants and refreshment stands.
- 2) That Commercial Zones consisting of a group of highway commercial developments should be established only at reasonable intervals as modified by topography or some special circumstances.
- 3) That these Commercial Zones should have limited access to the highway by means of a service road.

As you can well imagine this type of zoning is beset by problems. It is very difficult to explain to the individual landowner, who is fortunate enough to have highway frontage that he can not use his land for any or all commercial enterprises. It is difficult to convince him that a small business would be in any way objectionable on this wonderful main street the Provincial Government has built in front of his land. He wants only one little business. Also, he is getting

strong support from the developer and his real estate man. I am not going to suggest that our planning has been wholly successful in eliminating ribbon development along our highways at the entrances to the City. However, I believe our municipalities are doing a good job of limiting this type of sprawl. They are working against tremendous pressures brought to bear upon them by these landowners who are also municipal taxpayers. Thus our highways are being preserved to serve the people of the Province more efficiently.

Another facet of land use planning, which I am sure all that are attending this conference are conversant with, is resort and recreational development. The increase of leisure time because of the shorter work week for the urban worker plus the improvement in the means of transportation is creating a large demand for summer cottage development, picnic sites, and lakeside resorts. As evidence of the increase in interest I should like to point out that there were over 1,000 new summer cottage lots created in our district last year. This type of development to be adequate must meet the demands of both private and public interests. You are aware, I am sure, of the problems created by the lineal subdivisions of the past which have had the effect of limiting the public enjoyment of some of our best lakes.

The Commission is in the process of surveying and mapping all of the lakes in our district to assess their potential for resort development. Even at this time when the survey is still in the preliminary stages we are reaping the benefits. Proposals for lakeshore subdivision can be handled much quicker with much greater assurance when a general knowledge of the conditions prevailing around the particular lake is available.

In our consideration of development we are encouraging subdivision in depth with the provision of adequate access for the lots not fronting on the lake by means of walkways and park areas. These parks are small and quasi-public in nature. The provision of large park areas for general public use must necessarily be made by the Province or the local municipality. We have recommended areas to our municipalities for park purposes, for example - the M.D. of Leduc has a park of 118 acres in an area with about 3/4 of a mile beach front on the west end of Pigeon Lake. This area was purchased by the municipality about 4 years ago and they are developing it gradually.

The member municipalities in the Commission are well aware of the provincial parks program and appreciate what is being done. I am sure that the Parks Board has had reason to know about this awareness. Our M.D.'s have had their share of pet projects with which they have approached the Board in the hope of getting their sponsorship.

Up until this point, I have been discussing land use planning in the light of urban pressures. This involves the more intensive use of land. Rural planning in our district must concern itself with the more extensive land use in line with the changes in farm technology. The objective of rural planning must be the optimum use of resources, both human and natural. The attainment of the optimum use of land requires a thorough knowledge of its capabilities and limitations. In past generations, this knowledge could only be acquired by experience. Unfortunately, in the early settlement of our prairies a large number of useful life times were wasted in an attempt to obtain a living from land which, because of the nature of its soil and topography, could not support a farm family even at a subsistence level. A tremendous amount of research has been done by both the Federal and Provincial Departments of Agriculture. Information is now available to the individual farmer as to what he may expect from his particular farm area, and what steps he must take to achieve a permanent farm enterprise.

A form of rural land use planning commenced in the Edmonton District with the formation of the Agricultural Service Boards. These boards depend upon the basic studies carried out by the specialized agricultural agencies. The District Planning Commission staff began to plan for the development of rural land with the preparation of a General Plan for the Municipal District of Stony Plain.

It is the purpose of a general plan, as defined in Alberta, to provide for the orderly and economic development of all the land within a municipality. Economic is used here in long-term sense of continued productivity, and of maintenance of soil fertility and along with it, municipal and individual solvency. Therefore, to determine the economically optimum use of land, an attempt must be made to assess all the factors which will influence this use. The analysis of the existing land-use, soil, topography, existing agricultural activities, the economics of marginal areas, and the present relationship of human settlement to public improvements will form the foundation of the rural land-use plan.

Once having determined the optimum land-uses, it is possible to estimate the maximum rural population. Then an examination of physical and social facilities - for example, the network of roads, schools, libraries and churches that will be required to serve this population - may be carried out.

The analysis was made on the basis of information gathered from agencies working in the various fields involved - for example, the Alberta Soil Survey provided us with the information with regard to the soil resources of the area. A number of University of Alberta bulletins on farm practice gave the basis for the generally

accepted proper agricultural land use for each varying soil area. Certain studies had to be carried out to augment the data which was available. A land use guide was evolved from the information obtained. This guide allowed us to estimate the future rural population of the Municipal District on the basis of the optimum use of the agricultural land.

It is not the intent of the plan to lay down precise and comprehensive prescriptions for fields in which others are more experienced and qualified. The plan is intended to coordinate the work and information of the various agencies as it applies to environment of the farmer and his family.

The General Plan sets out recommendations to the local municipality. Certain of these may be adopted by the Council in the form of a by-law or others because of their long-term nature may be adopted by resolution to form a basis of municipal aims and policy.

We feel that the Edmonton District Planning Commission has the opportunity to make an unique contribution in the long-term planning of rural municipalities. The various public service agencies are working individually towards the common goal of the establishment of a permanent and economically healthy rural community. The general plan for each municipality and the overall plan for the Edmonton District can be a framework for the very necessary, effective coordination of these efforts.

In conclusion, I should wish to emphasize the necessity for more detailed mapping, research and information; certainly proper planning for the future communities of Alberta needs more information as to the existing conditions.

## QUESTIONS

QUESTION: What aerial rights does a land holder have? Are aerial rights zoned?

ANSWER: I would say that this only comes up with regard to airports with building regulations. We consider the height of buildings. It has been pointed out to me by the Department of Transport, Federal Government, that the Province or Municipality does not have the right to zone everything. It is the perogative of the government. There was a case in Manitoba where a person who wanted to run a private airfield had a license from the Federal Government and placed it in a position where the local municipality objected and so did the Province. He took it to Supreme Court - the courts said the Province and the municipality did not have the right to zone as far as an airport is concerned. Federal Governments say there has to be one hundred and fifty feet at the end of runways. People using land have nothing to say.

QUESTION: Can you subdivide land over a pipe line or power line and if so what restriction is there to prevent the construction of building on a pipe line or power line right of way?

ANSWER: The very fact with right of way is that there are restrictions. If the utility company has bought the land it makes it so that land is no longer in private hands, and you cannot build on it. As far as the matter of subdividing goes, it does mean as I indicated before. For instance, 80 acres of land with high-pressure pipe line across is subdivided on a basis of triangles. Therefore you would have to cut across those triangles.

QUESTION: Could it be said that a fair tax for the small holding should not be greater than the tax on the closest full quarter section?

ANSWER: This is debatable to a point. Of course, from the outset the small holder generally is working in urban areas while a farmer is making his livelihood off rural areas as opposed to farmers on a full quarter section. Because the farmer is existing on his land alone, the small holder has to pay taxes on his land and also on his house. This is discussed fully in the Small Holder's Report that is coming up.

QUESTION: What is the estimated population which the boundaries of Greater Edmonton as portrayed in the large map will take care of by careful planning?

ANSWER: I would not like to estimate what the area would take in in population.

QUESTION: Is a farmer, living in the municipalities adjacent to Edmonton, legally obliged to obtain the consent of the Edmonton Planning Commission, before he can carry out construction, alteration or removal of farm buildings?

ANSWER: No! Farm buildings as such are not under interim development. I would like to point out quite clearly that the District Planning Commission has representatives in the individual municipalities and is not the development authority. We may consider as a group but the matter of development is in hands of local municipalities.

QUESTION: Are school sites permitted adjacent to highways and main traffic routes?

ANSWER: Generally no. Actually this problem does not come up too often. Usually places within an urban unit are selected. There are some schools that are adjacent to highways, but none built recently.

QUESTION: Do you not consider that three acres as a size for subdivision is too large for a man to care for by hand tools, and not large enough for him to be able to afford power equipment with which to properly keep it in shape?

ANSWER: Actually there cannot be a qualified answer. On the basis of experience in the Edmonton area that is so; however, there are a considerable number of tools, motor tools and man driven small power machines. In the Edmonton area I would think that three acres is too large for a man to work in his spare time, as a small holder would try to make his living in that area. In the Edmonton area more workers are working their land in the summer. It would have to be a willing man to work in an office during the day and then come home to work his land. As far as tools are concerned, it is becoming more possible to work it with power machinery.

## "WHAT PROVINCIAL PARKS MEAN TO THE CITIZENS OF ALBERTA"

HENRY LEMBICZ

Chairman

Aspen Beach, Provincial Parks Advisory Commission

This paper is written to illustrate the observations and recommendations of a citizen who has for many years observed the changing face of our Province. It has been of much interest to the writer to follow the efforts of the Provincial Parks Board in retaining and developing our recreational areas. I have been very much interested in this work and the recreational areas of our Province because I believe "it is very important to make a living but it is just as important to live a life". I feel that our recreational areas play a vast part in our living a life and there will be a greater need in the future as the trend seems to be, more tension, shorter work hours and an increasing population.

In an effort to point out the part our recreational areas play in our peoples lives I would like to use first, Aspen Beach Provincial Park at Gull Lake as an example. This mile long sandy beach had been used by the cottage owners for years with a small number of the outside public using it on Sundays and when the fishing was good. About ten years ago some interested citizens contacted the Provincial Parks Board for improvements. A meeting was held, an Advisory Committee appointed and the work began. Today we have five picnic kitchen shelters, many out-buildings, tables, benches and childrens playground equipment. Roads were built, parking areas leveled and fenced. The result of the work was justified. Where a handful of people used it before, now they come there by the thousand, especially on a long weekend. The majority of the people coming to the lake, come for the day or a few hours. They come to swim, boat ride, relax, fish, and play ball. Most of these activities are associated with a picnic lunch. The park facilities are also used for family picnics, club picnics and other organization gatherings. I have found by short visits with those coming to the park on long weekends to camp that the majority are from Calgary and Edmonton and a large percentage are salaried employees. They are glad to get away from the regular grind and welcome the opportunity of a change in environment. It is interesting to watch them drive down to the lake, admire it for a while, then select a campsite and hurriedly set up the tent. From there on the procedure will be as desired by the individual concerned. If it happens to be a family, mother will possibly rest on a blanket on the sandy shore while the youngsters wade in the water and dig in the sand. Father may rent a boat and take the older children with him to catch a few fish. It is possible he will not catch a fish, but one thing I am sure of he will be asked a lot of questions. Such as, when he pulls in his fish lure loaded with weeds. Daddy how come weeds grow on the bottom of the lake? How does a fish live in the water? How does all this water get here, etc.? The boat moves in closer to shore and a mother duck with

her brood following closely behind hurries to keep a safe distance. The red wing blackbirds get excited and fly around chirping, the reason is their nest is in the rushes just above the water. A blue heron rises from the reeds and flies to a new feeding ground. All of this and more is observed by the occupants of the boat. They fish for a while longer and then as the afternoon wanes they go ashore for a hearty meal. Then to bed just as the sun is setting behind a cloud, creating a colorful sunset. The little tots fall asleep quickly as they have had a tiring afternoon. The older children that went along in the boat wonder for a while about what they have learned that afternoon. They do not know how all these things take place but they have a feeling that some great power must exist. The father and mother have visited the natural areas many times and they understand God's great plan. They rest assured that no matter where they are their future is guided by a Divine power which has guided the destiny of our world for millions of years. Having left their every-day problems at home, they too soon fall asleep to the tune of the yodel of the coyote and the weird cry of the loon.

I have wandered off on this little story because I thought it would illustrate the impact the natural areas may have on those using them. Similar experiences would come about by a trek though the woods, a fishing trip on a stream or a trip into the mountains.

People visiting our parks with their natural surroundings find an interest that makes for a better and fuller life. It has been found that children who are keenly interested in nature are very seldom juvenile delinquents.

At this time I would like to recommend that where there is going to be camping and trailers involved, an area should be designated for that purpose. This area should have the necessary facilities to accommodate those using it. The rest of the park should be used only for picnicking, relaxation, sports and playground equipment. If you let campers place their tent anywhere they like in the park there are some who will be too far from the outhouses, others will cut small trees for room, or use small trees for weiner roasting sticks. Then there is the hoodlum who wants to camp in between the big trees and he thinks he should have a ditch a foot deep around his tent to keep the water from running under it. To get this he cuts the roots of the trees. Of course he must have a fire in front of the tent, result is, more roots destroyed. Sometimes there arrives that little demon who is the pride and joy of mother and dad, he must show his parents he is capable of cutting down a good sized tree. Most campers are considerate people, but a few inconsiderate ones can, over a period of years, ruin the trees and foul the area. A park is not very desirable without trees and it takes many years to grow them.

The small roadside park should be commented on as I believe they are a credit to the Province and fill a great need for the travelling public. Many people carry their own food and need a place to lunch along the road. Other travellers who may become weary or sleepy while driving are happy to find a small park along the road where they can stop and rest or have a few minutes sleep. I would venture to say that it is possible that some lives have already been saved this way.

The pot-hole dams and small lakes where rainbow trout or other fish are planted and thrive are playing a very important part to fill a recreational need, especially in the more heavily populated areas. A pot-hole situated near a town or city gives those people who work throughout the day an opportunity to drive out and have a few hours of fishing in the evening. The greatest joy and need is had by the teenage school children who cycle or drive out after school for a little fishing. Pot-hole fishing fills its greatest need in the southeastern part of the Province. This part of the Province has little to offer in the way of natural fishing, therefore the pot-hole stocking brings more fishing into their district. I will use Boelke Pond some twenty miles south of Halkirk as an example of the enjoyment and relaxation the people get from the rainbow trout planted in this pond. I have had the opportunity to view the activities of the people visiting the pond on a Sunday. By mid-day there are people fishing all around the large pond. Others would be eating a picnic lunch, some would be lying on the hillside relaxing. The more skilled fisherman would be hip deep in the water gracefully casting a fly or lure. The old people would fish by casting their bait as far as possible and then sit on an old chair or box and swap yarns. All the time they kept an eager eye on the rod tip for a sign of activity. When this happened they ran up the bank dragging the fish out with as much excitement and enjoyment as a school kid.

I have told a story about a few specific places and I feel it is fair to say the same story will well apply to others that have been developed for recreational purposes. All suitable areas that may be utilized for recreation should be retained in the populated areas of the Province for future development. At the present time I believe development is behind the need.

By taking a broad look at our Province with an eye on the future I would say that the people of Alberta are very fortunate. In the central part of the Province and extending to the eastern border we have highly productive agricultural land. Throughout this area and reaching into the foothills to the west we have vast deposits of natural gas and oil. Running out of the mountains to the west we have a number of substantial rivers to provide water for industry and

agriculture. This favorable situation should develop into many new industries. At the back door of these potential developments we have a wonderful recreational and water conservation area extending along the western margin of the Province. This area is known as the Rocky Mountain Forest Reserve. As our Province develops with its increasing population there will be a greater need and demand by the public for the use of this area for recreation and relaxation. At the present time much of this area is used to pasture cattle and sheep. The wise use of this area for the future does not include farming it. First consideration for the area should be water conservation, second, recreation for our public, third, as a tourist attraction. A large percentage of the forest reserve should be set aside as a truly "wilderness area" where the people who come after us can go and see nature as God created it.

## QUESTIONS

QUESTION: What is being done to locate more roadside picnic sites in the Province?

ANSWER: This is a question that could be answered by the Department of Highways. I have no information myself except the observations I have made. I think it is safe to say that roadside camps construction has been accelerated in the last few years. I am not too qualified to say, but I am sure there will be more camp sites established by the Department of Highways that will aptly serve us.



"A BRIEF DISCUSSION OF THE REQUIREMENTS, PRESENT STATUS  
AND FUTURE POSSIBILITIES OF AIR SURVEY"

A. J. O'GORMAN  
Hunting Survey Corporation Ltd., Calgary

The ultimate requirement of Aerial Photography is, of course, the print that is delivered into the hands of the User.

I wonder how many of you, once you have the photographs, realize the complexity of the process required to produce those prints. To illustrate this point, we once had the misfortune to deliver a map that was in error by more than the allowable tolerance. The resulting investigation indicated there were sixty-two (62) individual steps from the commencement of the operations to the delivery of the final map, any one of which could have caused this particular error.

Basically there are three broad requirements that must be met to ensure the obtaining of satisfactory aerial photography. These are, (1) the air survey platform, (2) equipment, and (3) personnel. The first step in any air survey program is the acquisition of an aircraft that will economically perform within the limits laid down by the scale of the photography required.

Photography can be broken down into three types, the low, the medium, and the high level groups. In the low level group, we consider photography up to a scale of 2,640 feet to the inch, the medium level up to a scale of 3,333 feet to the inch, and the high level above 3,333 feet to the inch. Each one of these scales of photography can be most economically obtained by a particular type of aircraft. In the low level field, Hunting operates the Anson Mark V, Cessna 180 and the Beach D-18. In the medium level field, we operate the Beach D-18 and the Hudson, and in the high level field, we operate the B-17; the old converted "Flying Fortress" of past World War II glory. The selection of World War II aircraft was an obvious one for economic reasons. These aircraft were available at relatively low rates and could be converted to a suitable base for the air survey camera. They all possessed to a marked degree, stability, endurance, and safety.

Because of various clients' requirements, we must not only have a camera in the aircraft but also airborne geophysical equipment and other air survey instruments such as the Airborne Profile Recorder.

It might be pointed out here, although it is rather extraneous, that a suitably equipped aircraft, such as the B-17, can now carry sufficient equipment to produce all the basic data that is required for contour maps of fifty (50) foot interval. In many cases, this data has produced maps that have proved to be accurate to within the limits of twenty-five (25) foot contouring.

The air survey camera itself is probably the most essential piece of equipment carried by the aircraft and is in fact, the heart of the entire operation. We operate the Wild RC5A, RC8, and the RC9, and Fairchild K-17. The first two types of cameras have six (6) inches focal lengths and the RC-9 has a specially developed three and half (3 1/2) inch focal length, which will probably have a wide application in the northwest territories and is presently being employed in the western part of the Arctic. This extremely short focal length, wide angle camera lens is designed to cover large areas of ground which have relatively low relief. It enables the air survey contractor to operate from roughly one-half (1/2) the altitude and still produce the required photographic scale.

It will, of course, have applications in many other parts of the world. The K-17 is fitted with a twelve (12) inch lens for special forestry requirements.

Anyone who has examined photography that was exposed prior to the advent of the new Wild and Zeiss cameras, will of course, have noticed the tremendous improvement in quality resulting from the later type of cameras. Mind you, there was also a considerable increase in the cost of cameras as a new modern air survey camera may run as high as \$15,000.00 per unit, as against \$3,000.00 for the older cameras. The air survey cameras have reached a high degree of reliability, and perfection and it is difficult to see where future improvements can be made in their optical qualities or mechanical design.

The film used in the camera is generally the commercial variety referred to as Kodak Aerographic Super XX, or equivalent. We have been experimenting with a new type of film that we hope will be on the market this year, which in tests we have performed, has indicated approximately 30% improvement in resolution. We have established a test bed and it is in photographs of this test bed that the improvement has been noted. We are greatly pleased by these results and although they are not conclusive, we sincerely hope that this improvement will live up to its original expectation.

We have obtained photography down to scales as low as one hundred and fifty (150) feet to the inch and as high as five thousand, five hundred (5,500) feet to the inch. The problems of obtaining one are just as great, although of a different nature, as those encountered in obtaining the other. In the first case, you are

limited by the aircraft, shutter speeds, and the speed of the film, and in the second case, you are limited by the ability of your airborne equipment to get as high as required, and to stay there for sufficient length of time for such an operation to be economical.

After exposure of the air survey film, the next step of course, is its processing. We have been utilizing, in the last three or four years, a continuous process machine which has incorporated in it a device to constantly replenish the developer solution. This constant replenishing is automatic and is done through a continuing analysis of the actual developer solution. This step we have found, has ensured a higher uniform quality of film throughout the roll or series of rolls and has added in small part to the quality of the final product. All our films are now developed in airconditioned areas and after testing, each film roll is stored under humidity and temperature conditions laid down by the manufacturer.

The printing of air survey films has, of course, received a tremendous boost from the introduction of the Logatronic, Cintel, and other automatic printing systems. A great deal of guessing, if you will pardon the expression, on the part of the printer has been removed and as a result, we can now produce high quality uniform tone prints, with relatively little trouble. We have found however, that the introduction of new gadgetry of course brings with it the need to introduce the technicians that can maintain the equipment and repair it when necessary.

We are at present operating a continuous strip printer which will print an entire roll of film, at one-half contact scale. These prints are used to check coverage, tip, tilt, cloud and cloud shadow on the exposed film. We hope this system can be expanded to allow continuous printing and developing, washing and drying, of contact scale photos of high quality. This equipment has a great deal of development work yet to be done on it but it does hold hope for the future.

The third element of successful air survey is the personnel that do the actual flying. The people involved in air survey work are, by comparison to a norm, a bit of a race apart. When you consider that these men are removed from their homes for six months or longer at a stretch, it is easy to see that they are doing this type of work for more than love of money. They are an adventuresome sort and generally have a genuine love of flying for its own sake. Most of them are graduates from the military organizations, but some of them, and some very good ones, are a result of their own initiative in obtaining the necessary training to qualify as an air survey pilot, camera operator or navigator. In the past, we have found that isolation has led to problems and presently all our air survey personnel receive psychological testing. This insures that individual personalities, which could lead to serious trouble on an isolated survey program are

not in conflict. We have found that this technique has paid large dividends in our organization and would recommend it to any similar group.

What lies in the future for the air survey business will be twofold; First a general improvement in all the equipment, hardware and techniques which will be reflected in the quality and cost of the end product.

Secondly, there are developments under way which could be classified as rather fantastic at the moment, but in substance, it is hoped to be able to produce a topographic map purely by the use of electronics. There is reason to believe that this system will work and the very preliminary tests on various components have indicated that this may very well be possible. As I mentioned earlier, it is now possible for a single well-equipped aircraft to produce from the air all the information required for the preparation of topographic maps.

We have developed an instrument which will produce topographic maps automatically. This instrument is called the "Stereomat" and employs electronics in place of optics. I have watched this gadget work and it is eerie to watch the table trace out contours and produce profiles all on its own.

It is hoped that a series of television scanners mounted in the aircraft along with other equipments, can relay the information to this or another type of machine which will produce topographic maps of the area covered by the actual aircraft in flight. This may sound incredible, but when you realize that we now have pictures of the far side of the moon, I don't think that it lies outside the realm of possibility. It is possible in the future that air survey requirements may be met in terms of hours rather than in terms of weeks, months and even years as at present.

I want to thank the committee for asking me here, and I hope that I have in some way indicated the present and future scope of the air survey business.

Thank you.

## Q U E S T I O N S

QUESTION: What is the future of aerial color photography?

ANSWER: We have done aerial color photography. It boils down to the problem of color rendition standards for the area. In other words, parts which are almost impossible to off-set at the time of flying. One system that is used in the States is to fly aerial black and white. The time of actual exposure is reduced by well over one-half. In other words, you fly from 8:00 to 4:00 in the afternoon in black and white. You can only fly from 10:00 to 1:00 and get good color. This increases the price two to four times from black and white. On your black and white you can bash off as many prints as your individual department requires. It is very costly to duplicate color transparencies. With the color transparencies you are limited to the original.



## "THE USE OF PLANIMETRIC MAPS AND AIR PHOTOS IN THE OIL INDUSTRY"

J. H. BLAIR  
Shell Oil Co., Calgary

### Introduction

To the uninitiated, the use of maps is sometimes awe-inspiring and even those who do use them are somewhat confused, especially when it comes to the well known problem of folding a road map. If the use of maps is somewhat complex to many, then the use to which the oil industry puts air photos would leave them agog. On one occasion a gentleman who was not too well informed on the subject of air photos and had had little experience with the oil industry was being given a tour through a drafting office in Calgary where aerial mosaics were being made. His guide pointed to one of the mosaics and was beginning to explain that they were used quite extensively for planning in the exploration for oil, when our uninformed friend interrupted the conversation by asking "whether the lakes", which often appear as black areas on the mosaics, "were actually pools of oil". I am sure that many in the oil industry wish that it were possible to build a few mosaics and find pools of oil that readily.

Government maps and air photos have been most important in the exploration phase of the oil industry. In a degree they have assisted in the orderly planning of the development stages right up to the time we have oil in the pipeline. So I would like to take you through these phases showing their uses as I go.

### For Geology

The use of the air photo has become such an essential tool in geology that I would venture to say that most geologists in Canada or in most parts of the world today would find it unthinkable to commence work without a good set of photos. This use has reached such refinement that the industry has generally accepted the photo-geologist as an integral part of reconnaissance geology which is often the first step in exploration. These geologists pore over photo after photo and with even just a limited or general knowledge of the type of rock strata of an area, can come up with a reasonably accurate map of geology as it appears on the surface.

One oil company and several consulting firms are refining the techniques of photo geology by going so far as to use stereo-plotting machines. They assure us that measurements of strike and dip on rock outcrops can be made as accurately by this method as in the field. And so the trend goes in the use of aerial photographs for use in photo geology.

Some geologists have gone into such scientific aspects of tectonics (forces which have gone into making up the earth's crust) as "Fracture Analysis." This is a study of such forces as gravitational pull upon the earth's crust and by studying air photos and planimetric maps they claim to recognize the effects of these forces in such a way that possible oil bearing areas are apparent. I am told, for example, that the surface patterns recognizable on air photos over the Redwater field are quite noticeable and merely by inspection of air photos similar oil accumulation could conceivably be recognized. But I must be careful not to begin a controversy on technical matters to which I would not be capable of giving any answers.

Once the photo-geologist has produced his map the field geologist takes over. He goes to the field to confirm what the photo-geologist feels he has seen, and in many cases several interpretations may be available, so he takes with him to the field a number of photo geological maps along with arm loads of Provincial Government planimetric maps and Dominion Government topographic sheets. In addition to maps, he of course takes a complete set of air photos and more than likely a photo laydown or mosaic of the area in which he is to work for the season.

Once he has determined from his maps and air photos that he is within the area designated to him for the summer he sets to work seriously and begins examining and detailing the rock outcrops. Again the air photo comes into play and when he has located the outcrop on which he is working on the photo he merely takes a pin and pricks a hole through the picture. To this pin prick on the reverse side of the photo he assigns a number and correspondingly in his note-book records his findings against the same number. When he gets back to camp, with his rock samples and notes that evening, he will probably spend at least a couple of hours plotting his findings on a work map which will more than likely be a Provincial Government planimetric sheet.

This same method by the way, is an excellent method of recording a good fishing hole.

I might interject at this point that as I recall, the earlier planimetric maps show the centres of the photos used in their construction. This is most useful, not only in field work both in geological and engineering projects, but also is a wonderful reference in the office for co-ordinating photos with the maps.

### For Geophysics

The geophysicist, similar to other exploration people, is a product of a highly technical education and talks in terms of anomalies, interval velocities, second vertical derivatives and other such terms designed to confuse the uninitiated, when it comes to

control in an area or access into a region of rough terrain, we find him also talking in terms of planimetric maps and fiducial or nadir points relating to air photos.

In airborne magnetometer surveys a continuous record is made along a certain flight path of the total magnetic intensity of the earth below. On most surveys every few seconds a 35 mm picture is taken and a little blip mark appears on the record at the moment of exposure. In order to control the survey these photos are then compared by inspection with existing photography, which as you know, are tied in to the provincial planimetric sheets and so the flight path can be accurately determined.

Preliminary to seismic operations, some companies have had a photo interpretation expert examine a prospect to determine the amount and extent of overburden or glacial till, which in some cases, prevents the obtaining of records. So air photos can be used in many cases to determine whether the dollar spent will obtain the desired results.

In the unsurveyed areas of the province or in the most rugged foothills there are many miles of bush trails which can be traced only on air photos. It is by using these trails in many cases that access is gained into some of the remote spots and indeed preliminary work is often carried out along these lines. This work starts several weeks ahead of sending out a seismic crew by ordering rush - rush, from the Department of Lands and Forests, the latest air photos and planimetric sheets. In most cases a rough photo laydown is made which gives the overall picture of the prospect and this is reduced to the map scale. The trails are then transferred to the map. These maps are then put into the hands of those who plan the field work. With due regard for stream pattern and other topographic features and existing trails a possible tentative program is laid out. This is usually done at what appears to be a frantic pace and while the program is being laid out in the office one of the operational or field men will be flying over the area with a copy of the same maps and mosaics gaining a first hand knowledge of the terrain over which he is going to put his crew. No doubt this is why the geophysicist is such a cautious person, and always punctuates the title of his maps with the words "possible and tentative or proposed", since he has a hunch that someone else will change it all anyway. The important thing to remember here of course is that both photos and maps are the basis for all this feverish activity.

The "Forest cover" maps, which have been done primarily for the inventory of our Forest resources, are becoming a most useful map in the oil industry. With these maps we are able to plan our exploration program in such a way as to avoid the useful and heavy stands of timber. Wherever possible our lines can be planned taking advantage of areas of light growth, burned areas or through types of timber having

the least commercial value. We are also finding that since the photography used for producing these maps was taken with the last two years they can be used to locate trails and lines for our current program. This of course, is most useful in helping to keep costs down.

Next we find the crew in the field. The preplanned program can be followed with incredible accuracy and any slight deviations necessary can be spotted a day or so in advance of the bulldozing by using a set of photos which the survey crew has taken to the field with them.

Some oil companies have gone so far as to make special arrangements with the Department of Lands and Forests for copyright rights for the planimetric sheets and have blown them up to double size. In this way one township nicely covers a planetable board. The survey is then plotted directly to the map by the use of an alidade. These maps are considered to be of sufficient accuracy that the stream pattern can be used in unsurveyed territory for control.

### In Exploration Drilling

In planning a wildcat drilling site one of the first things to be studied is access. In order to arrive at this site requires something more refined than a rough seismic trail or even a normal bush road. Most foothills drilling is deep and requires a heavy duty rig. This involves hauling of heavy equipment and so the route has to be carefully selected. This is done in the preliminary stages by using a planimetric map for determining the general route to be followed, and air photos, from which can be reasonably estimated the slope or grades, and cut and fill, with due regard to rock outcrops, muskeg areas, tree coverage and drainage problems.

If a road into a location happens to be a long one or it is found necessary to build an all-weather road into the well because it cannot be completed in one winter season, then air photos in the hands of an expert "photo interp" man can save thousands of dollars not only in road location alone, but also in finding gravel for surfacing the road. Referring once again to the low level photography flown for Forest inventory purposes; we find they are becoming a useful engineering tool. Muskeg, outcrop, and run-off conditions can be studied in fantastic detail on the scale of photography. This photography will become even more useful in the development stages of drilling in areas similar to Swan Hills.

In addition to this, near most remote locations an air strip is built or a lake large enough for aircraft to land on has to be located. Here again air photos are used.

### In Development

The development of an oil field with its well site locations, roads, flow lines and tank batteries requires considerable engineering, and detailed planning. Although the industry has found existing photography and maps useful, the details necessary for engineering purposes have to be obtained by having the area reflowed by a commercial company at a suitable scale and topographic maps constructed. Depending on the roughness of the terrain large scale maps with contour intervals of 25' or even 10' are essential and when used properly can speed up development and save thousands of dollars. In most cases where an oil field of sizeable proportions exists a number of companies invariably are involved and it is most difficult to have all operators come together and share in a common mapping project. This has been done in some instances and two fields come to mind which were reflowed and mapped for oil companies by commercial air photo companies. These are Pembina and more recently the Swan Hills field.

As I have pointed out, however, in the initial stages of planning existing government photos and maps are used.

### In Pipe Lines

Here again, in the early stages of planning existing maps and photos are of some assistance. In the engineering and final stages of laying a pipeline more detailed engineering data are necessary and routes have to be reflowed and mapped at appropriate scales.

### Uses in Mapping

I have stressed in a very general way the extent to which government maps and air photos are used by the oil industry. Just how these are used in the mapping processes may be of some interest here and I will attempt to cite a few examples without laboring the details.

I have referred to the field geologist pricking the air photos with a pin for recording his locations and plotting up his work maps at night. This of course is a far cry from the final map presented to management. After completing his field season the geologist returns to the office and after gathering together all available data, reports and maps, with the aid of a draftsman commences his compilation or presentation map. Because all companies do not achieve the end result via the same path, I will attempt to include as much as possible in this summary of what is done.

First of all, the draftsman lays out a simple grid completed from the tables for the particular projection to be used. All available survey data are plotted and drawn from the government township plats. The primary stream pattern, trails, etc. are added from the planimetric sheets. If government topographic maps are available for the area, contours are drawn in at whatever intervals are necessary to emphasize the amount of relief. For additional stream pattern detail the map can be laid over a mosaic blown up to the same scale as the map and traced on. Considerable experience and judgement is required to obtain accuracy at this point in plotting any additional stream pattern and stereo pairs of photos are often used. Now that the base map is complete, the geology can be added. This will require constant reference to the air photos, geologists' field notes and maps, and a continual comparison with available government publications, reports and maps. So in this manner the oil company would arrive at a suitable surface geology map.

The proper construction of a photo mosaic is a real art and requires trimming, feathering and setting of precise control points, etc. Little of this is done by oil firms and I prefer to call our so-called mosaics "photo laydowns." Many, many photos are put to this use and as a rule to make one covering a sizeable area requires but a short time. With very little trimming the photos are usually matched up and, by inspection with reference to a government published map, controlled within reasonable limits. These "laydowns" are usually put together on sheets of plyboard and then photographed down to map scales. The individual photos can then be removed and used for other work. Because of this we cannot trim the corner on which is printed the picture number reference. If these numbers could be printed on the reverse side near the middle of the photo they could still be identified and more accurate laydowns could be made without destroying their usefulness for other projects.

In many instances where seismic work is done in a remote, unsurveyed area, aerial photographs are re-flown by commercial firms and in conjunction with what base line surveys are in the area with the additional help of planimetric maps for control, a reasonably accurate map can be drawn of the cut lines. This eliminates the need for costly control surveys and provides data of sufficient accuracy for plotting up a map. In most instances the contract photogramatists are called in to assist in the knotty problems of survey control via this photogrammetric method.

In discussing the engineering problems, I would be entirely out of my depths if I were to try to describe how the photogramatist with his wierd and wonderful plotting machines come out with a map which is suitable for development of an oil field and I will leave it up to them to describe just how this is done. Suffice it to say that I do

know in many cases, the Government photos and maps play an important part in this work.

### Conclusions

It is not necessary for me I am sure, to reiterate that air photos and maps play a most important part in the oil industry. What I would like to stress in conclusion, however, is that we have appreciated the part that the Technical Division has played in supplying the industry with maps and photos. Even facing a demand in many cases for service on a rush basis they have given wonderful co-operation. We have come to rely upon this service. Growth has been most rapid in the oil industry in the past ten years and I am convinced that this service has contributed greatly to the economic growth and development of our Province. We know that we can look forward to a continuing productive and happy relationship with them.



## "MAPPING IN ALBERTA"

S. BEGG  
Technical Division  
Department of Lands and Forests

Mapping in Alberta started approximately 160 years ago with the advent of such men as David Thompson, Duncan McGillivray, Captain John Palliser, Dr. G.M. Dawson, J.B. Tyrell, Dr. Edouard Deville, the father of aerial photography in Canada. It took the energies and foresight of these great men and many, many others, some remembered, some forgotten, to give us our maps of Alberta.

A word must first be said about the system of survey used before a complete understanding of mapping in Alberta can be gained.

The system of survey used in Alberta was devised by Dr. E. Deville some 80 years ago following the Federal Government's action on taking over the Canadian Northwest from the Hudson Bay Company. It was realized that the systems which were then in use were based on settlements located largely around or along prominent lakes or rivers, and gave a very hodgepodge collection of areas. It was also realized that future settlements would continue to gather in the fertile districts, more or less regardless of the intervening unsettled areas, or the distances between these settlements. To meet this anticipated situation, a survey system which would eventually include the entire area of the Great Plains as a comprehensive unit was required.

As a basis for this new system, initial meridians were run in a true north direction commencing at the International Boundary and  $97^{\circ} 30'$  West Longitude, the Principal Meridian. The Second Meridian was placed on  $102^{\circ}$  West Longitude, the Third  $106^{\circ}$ , Fourth  $110^{\circ}$  (the Alberta-Saskatchewan boundary) Fifth  $114^{\circ}$  (running north and south approximately 20 miles west of Edmonton), Sixth  $118^{\circ}$  West Longitude (lying just East of Jasper in Jasper National Park).

Next, base lines were run on which to construct the remainder of the grid. These lines run in a true East-West direction and areaa succession of chords each six miles in length, starting at at meridian and running westerly until the next meridian is reached. The International Boundary was accepted as the first Base Line and then successive base lines were spaced twenty-four miles apart.

Townships were then surveyed each approximately six miles square and numbered from south to north, starting at the International Boundary with Township 1. To further define each township it was

necessary to number each tier of townships from east to west beginning at an initial meridian. These tiers of townships were designated ranges and numbered 1,2,3, etc. westward to the next meridian. Each township was then divided into thirty-six squares each of one square mile.

It will be noted that because of the system of survey and its base it is possible to pinpoint any point, location or area in the province by two methods, the survey system in Sections, Township, Range and Meridian or in degrees of longitude and latitude, this then will tie the survey in with most map projections.

Mapping in Alberta, as done by the Department of Lands and Forests, is based on the Universal Transverse Mercator Projection which gives the closest representation of relative locations over a small area. Each map sheet contains an area of 15 minutes latitude and 30 minutes longitude or an approximate area of 340 square miles.

The first step in mapping by Aerial Survey, after the photographs are taken, is to choose control points identifiable both on the photographs and on the ground, then minor controls are chosen which tie each photo to its neighbors on all four sides, there being a 60% overlap between photographs in the same line and a 20% overlap between flight lines. Each point on a photograph will appear on from three to six photographs depending on the point's position on the photograph.

PHOTO OF TEMPLET CUTTER AND LAYDOWN



Templets are now made from the photos and all points of control transferred thereto, the templet is then cut on a templet cutter which cuts a slot approximately  $1\frac{1}{2}$  inches long by  $1/10$  of an inch wide, radial to the center. The length of the slot allows for scale variations.

While the templets are being punched and cut the map base, or manuscript is being constructed. As stated before it is possible, because our survey system is based on degrees of latitude and longitude, to calculate the coordinates of any point such as a township corner or a section corner etc. this then ties the system of survey with the map projection using the same base of latitude and longitude. After the manuscript has been completed, with all the survey therein compiled upon it, the control points that are visible and identifiable both on the photo and on the ground are plotted giving the major control that will hold the future laydown in place. It is now time to transfer all information, by aid of a flimsy or transparent material, shown on the manuscript to a plotting or laydown board. The laydown board will then contain the same information as is on the manuscript. All major control points are then pinned down and a red stud placed on the pin. These points are not to be moved at any time, the laydown must be made to fit these points.

The next step in the procedure is to lay the templets, which carry all control points and photo centres on them, on the board using blue studs to mark the photo centres and white studs to mark all minor control which are the ties between consecutive photos and flight lines. When the laydown has been completed, and left for a short time to settle, steel pins are then placed in the centres of the studs and driven home with a hammer. The templets are now lifted leaving all studs and pins in place, and as each templet is removed all information written thereon is transferred to the board, particular care being taken with the identification of major control, photo centres and flight information. After all data has been transferred to the board all pins and studs are removed leaving the original grid, as placed on the board from the manuscript, with a number of pin holes showing the minor control, or ties between photos and flight lines, photo centres plus the major control. These points are picked on to a flimsy and transferred back to the original manuscript.

During the time taken for the laydown the photos are being worked on, they are being interpreted for the information required to be transposed to the map base.

PHOTO SHOWING SKETCHMASTER



This transferring is done by using the sketchmaster. A sketchmaster is composed of a table under which can be placed a map and upon which can be placed a photo. The table can be moved in all directions allowing the operator to move the photograph about so that the largest possible number of points on the photo can correspond with the points that have been transferred to the manuscript via the templet laydown procedure. When the largest possible number of points have been oriented between the photo and manuscript the interpretation lying between these points is then transferred to the manuscript. When the manuscript is completed it is then processed in one of the many ways that give a finished map.

This is but one way in which mapping is being done in Alberta.

MULTIPLEX -- KELSH



Another way of mapping is the use of the multiplex and kelsh plotters. These machines are used in contour work and are being used with very good success in town planning, road building, water conservation and usages and many others. In this type of survey it is necessary to run a ground survey of levels for vertical control, and distances for horizontal control. In this type of work the available photography governs the end product or the reverse where the end product known will govern the type and scale of photography to be flown. There are many ways of arriving at a required plan in this type of work but all are long and involved procedures that time will not allow a description of here. These machines and machines of far greater precision than these shown are making great strides in reducing the costs in planning and surveying.

MOSAIC UNDER CONSTRUCTION



A pictorial way of mapping is to make a mosaic of an area as is shown being done here. A base map is stuck to a piece of cardboard or base material that has been cut to the required size.

## ZIESS RECTIFIER



Each photograph is then placed on the base with an adhesive to hold it in place but before the photo arrives at this point it has been partially rectified by the use of this Ziess rectifier. Corrections are made on this rectifier for tip, tilt and scale errors and the photo taken to the plane of the base map or as near as possible to such. The photos are then torn or cut to make a composite photo of a specific area. A great number of types of reproduction are available to reproduce this mosaic, one such finished product is shown here.

MOSAIC COMPLETE



It is suggested that anyone wishing further and more precise information regarding any of the procedures that have been mentioned in this paper they visit the display in the lobby and question the attendant.

## "THE UTILIZATION OF THE FORESTS OF ALBERTA"

E. S. HUESTIS  
Director of Forestry  
Department of Lands and Forests

The subject of my talk is "The Utilization of the Forests of Alberta". In order to get a proper picture of this subject it is necessary to give some of the history of forest use in the province.

The first recorded sales of timber occurred in the period 1880 to 1884. Up until 1930 the forest resources were controlled by the Federal Government. In these early days rather large areas of timber were sold on the basis of half cash with the balance of dues to be paid when the lumber was cut. The cruise estimate was very low in each case so that the half cash payment did not bring in very much revenue.

When cutting finally started dues were set at 50¢ per M.F.B.M. These were increased to \$2.75 and later to \$4.50 per M. which is the rate of the few remaining Dominion Berths which have not been cut out. Utilization on these berths was originally to a 7" stump diameter measured 18" from the ground using the tree to a 6" top diameter.

There was little thought of managing our forests until forest reserves were established beginning in 1906. The first reserves were Cooking Lake just east of the City of Edmonton, and south of Elk Island Park and Cypress Hills south of Medicine Hat. Finally in 1911 the Rocky Mountains Forest Reserve was established extending from Waterton Park in the south, along the Eastern Slope of the mountains to north of Jasper Park. A few years later the Lesser Slave Forest Reserve, surrounding Lesser Slave Lake, came into being.

With the formation of the reserves timber was sold on a competitive basis to the highest bidder. Timber could still be cut to a 7" diameter on a stump 18" above the ground. After the transfer of the resources to the province in 1930 a gradual move was made to obtain better utilization of our forest resources. The stump height was lowered to 12". A policy of elective cutting was set up to remove only 40 to 50% of the stand composed of the larger trees usually above 14" for spruce and 12" for pine measured at the stump. This allowed for continued growth of the smaller trees for a further cut at a future date.

The cruising of timber on the forest reserves was carried out in a fairly scientific manner beginning prior to 1920. However for the period up until about 1940 cruising in the rest of the forested areas was by the somewhat inaccurate ocular method. Since

1940 there has been a steady improvement in cruising methods leading to better utilization of the timber.

During the 1940's several events took place which indicated an increased interest by governments and other in the forest resources of Alberta. In 1947 the Federal and Provincial Governments signed an agreement setting up a joint board to direct activities on that part of the eastern slopes of the Rocky Mountains which controlled the headwaters of the Saskatchewan River system. The federal government supplied \$6,300,000.00 for capital expenditure while the provincial government supplied funds for the maintenance of the area.

In 1948 the rest of the forested area including the northern part of the Rocky Mountains Forest Reserve, comprising a total of 142,000 square miles was set up as one large forest area usually referred to as the "green zone". The two areas comprised over 151,000 square miles of the 255,000 square miles in the province.

In 1949 an agreement was signed by the provincial government requiring the Photographic Survey Corporation of Toronto to take air photos of the entire province and prepare planimetric maps. In addition the agreement required the company to take air photos of the forested area south of the 57th parallel at a larger scale, to supply forest cover maps and an inventory of the forest resources. At a later date the area north of the 57th parallel was completed by our department. Unfortunately the east slope of the rocky mountains was not included in the second phase of the work. The Eastern Rockies Forest Conservation Board had other plans. During the past two years this area has been photographed and the inventory and forest cover maps will soon be completed.

In 1949 for the first time the Department was approached by promoters of a pulp mill for the province. Negotiations were carried on for a period of some months leading to the signing of an agreement with a company known as the Edmonton Pulp and Paper mills. The Department agreed to set aside large tracts of timber for the use of the company. The company agreed to construct a pulp mill with a capacity of 300 tons per day within a specified time. They were also required to pay ground rental on the lease area together with fire-guarding charges. They were to operate the area under sustained yield management. A reserve area was set aside for future expansion. The company was unable to meet their obligations so the agreement was cancelled and the deposit of \$10,000 was forfeited to the Crown.

This agreement was followed by four similar incompletely agreements. Finally North Western Pulp and Power Company completed an agreement and constructed the first pulp mill in Alberta at Hinton.

The 1950's brought other steps in the better utilization of our timber resources. The forest inventory had shown that about half of our timber resources were deciduous species, principally poplar. In 1953 the Northern Plywoods Company constructed a plywood mill at Grande Prairie to utilize some of this poplar. This was followed by 2 other plywood mills located in Edmonton. These mills are now utilizing pine and spruce timber as well as poplar. Recently a pressed board plant was established at Wabamun using poplar material.

Let us look for a moment at the history of sawmilling in Alberta. Prior to 1930 there were a number of fairly large sawmills at various points in the province. There were also a number of smaller mills. As the available sawlog material receded from the railways, rivers or good roads the large mills were replaced by smaller mills located closer to or in the available timber. Hot logging became the regular practice of most operators and mills generally were not too efficient. Much of our timber ended up in the sawdust pile, the shavings pile, the slab pile or the burner. In the 1940's for the first time all operators were required to have edgers at their mills. In the 1950's a number of operators purchased gang saws to cut down the sawdust waste and give more even-sized lumber to reduce shavings in the planer operation. During the past year a mill at Obed has installed a barker and a chipper. In this operation all slabs, edgings and trims are chipped and sold to the pulp mill to be converted into pulp. The only loss of material from logs is the bark, sawdust and shavings.

In the sawmilling business trees are utilized from a 12" stump to a 6" top diameter. It is conservatively estimated that about 50% of the average log is converted into lumber, the other 50% is lost as slabs, edgings, trims, sawdust and shavings. In the past 40 years we have produced in this province roughly 350 million ft. B.M. per year or 14 billion feet B.M. of lumber. We have wasted another 14 billion feet of solid wood material because of milling methods, lack of mills to convert the waste to other products or because of lack of markets for byproducts of sawmill operations which might be produced. It is estimated that 10,000 ft. of lumber would build a fair sized house. The waste for the past forty years if it could have been utilized as building material, would have produced 1,400,000 houses or more than one house for every man, woman and child in the province.

I would now like to present some graphs and diagrams to help describe some of the points brought out above and to bring out some new ones.

In the first graph the annual production of forest products is shown for the fiscal years 1920-21, 1931-32, 1940-41 and for each year from 1950 to 1959. You will notice that the production in 1920-21 was almost as high as some of the 1950's however there is a great difference in the kind of materials produced. In 1920-21 lumber made up only 27% of the total, the balance being ties, cordwood, posts,

poles, rails and mine props. During this period in the history of our province many areas were being settled by homesteaders requiring posts, poles, fuel and building logs. Mines were running at full blast, requiring mine props in large quantities. The column for 1931-32 indicates the depression while in 1940-41 lumber represents 73% of the production, a reversal of the proportion shown in 1920-21. During the 1950's lumber represents a greater percentage of the total until the new products of plywood and pulpwood enter the picture.

In the second graph the production in the 1950's other than lumber shows that ties play a prominent but not stable part. Round timbers such as mine props, fuelwood, posts and poles show a marked decrease from former years due to the closing of mines and the more extensive use of gas and oil for heating and cooking. Pulpwood production, export of dry material to the United States is very small until 1957. In the next two years with the operation of the pulp mill at Hinton a very large increase is noted. The amount of material being used for plywood shows an increase from 1953 when Northern Plywoods started production.

In graph three we have attempted to show in diagram form the percentage of utilization of wood material in the log by producing either lumber, ties or plywood. You will note that lumber shows the greatest and plywood the least waste.

Graph number four shows the utilization of wood material in converting logs to pulp. In the chipping process all wood is used except the bark. However you will note that the conversion of wood chips to pulp varies with the processes used. The Hinton pulp mill uses the sulphate process.

In the final chart we have shown in diagram form the percentage of a tree which is utilized by processes other than the making of pulp where the entire tree from stump to a 4" top diameter is used.

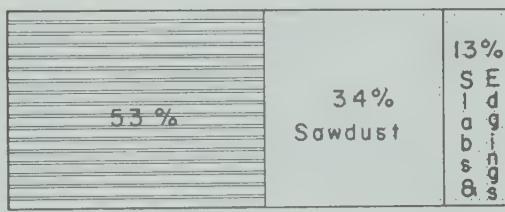
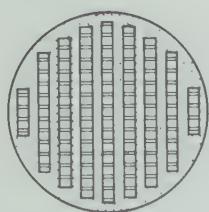
In the first diagram we show the loss of the stump, the top and all wood material in the branches. There are places in the world where branches and even roots are utilized for fuel or other purposes. You will notice that the loss in ties, plywood and lumber is fairly close. In the plywood mills however cores are being converted into as much lumber as they will produce. When cores can be used for pulpwood the utilization will be still greater.

In the fifth diagram we have shown what might be accomplished in an integrated operation, losing only the stump, top, shavings and sawdust. At the present time we have only one operation in Alberta of this kind, the sawmill at Obed, referred to earlier in this talk. Here with the use of a barker and chipper and with its proximity to the pulp mill, only the bark, shavings and sawdust is lost in the milling of logs.

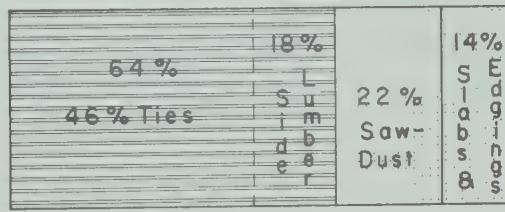
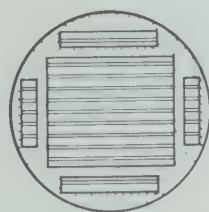
This province needs plants that will make use of our present waste wood material. We have made some headway in a pulp mill, plywood mills and a pressed board mill but we would welcome more of these and any other type of mill to use waste wood for the production of any product for which a market can be found.

Briefly I have attempted in this short talk to review some of the phases inherent to utilization of our forest products in Alberta. May I close by saying that it would be difficult to over estimate the importance of better utilization practices. It is essential to follow trends and keep abreast of developments as you will hear more about from the speakers who follow me.

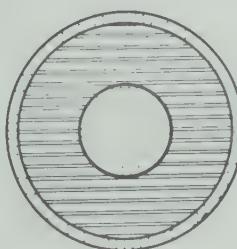
### UTILIZATION OF LOGS OR BOLTS



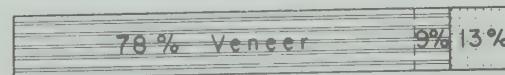
L U M B E R



T I E S

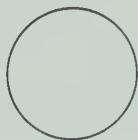


P L Y W O O D



(87% if core utilized for lumber.)

# PULPWOOD

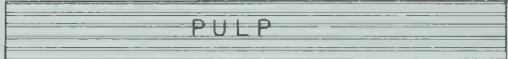


=

ENTIRE BOLT CONVERTED TO  
WOOD CHIPS

BUT PERCENTAGE CONVERSION OF  
WOOD TO PULP VARIES WITH PULPING PROCESS:

<u>PROCESS</u>	<u>CONVERSION</u>
----------------	-------------------

GROUND WOOD	 ALMOST ALL
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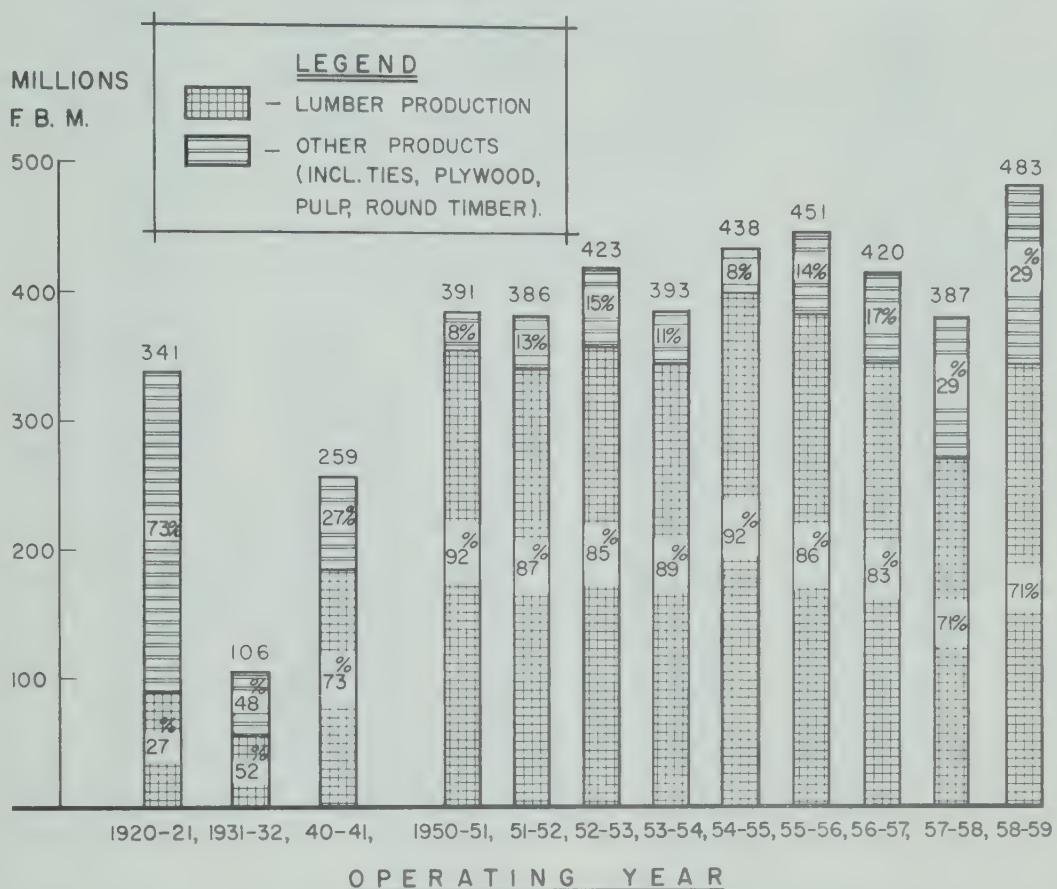
SULPHATE	 ABOUT 50 %
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SULPHITE	 SLIGHTLY BELOW 50 %
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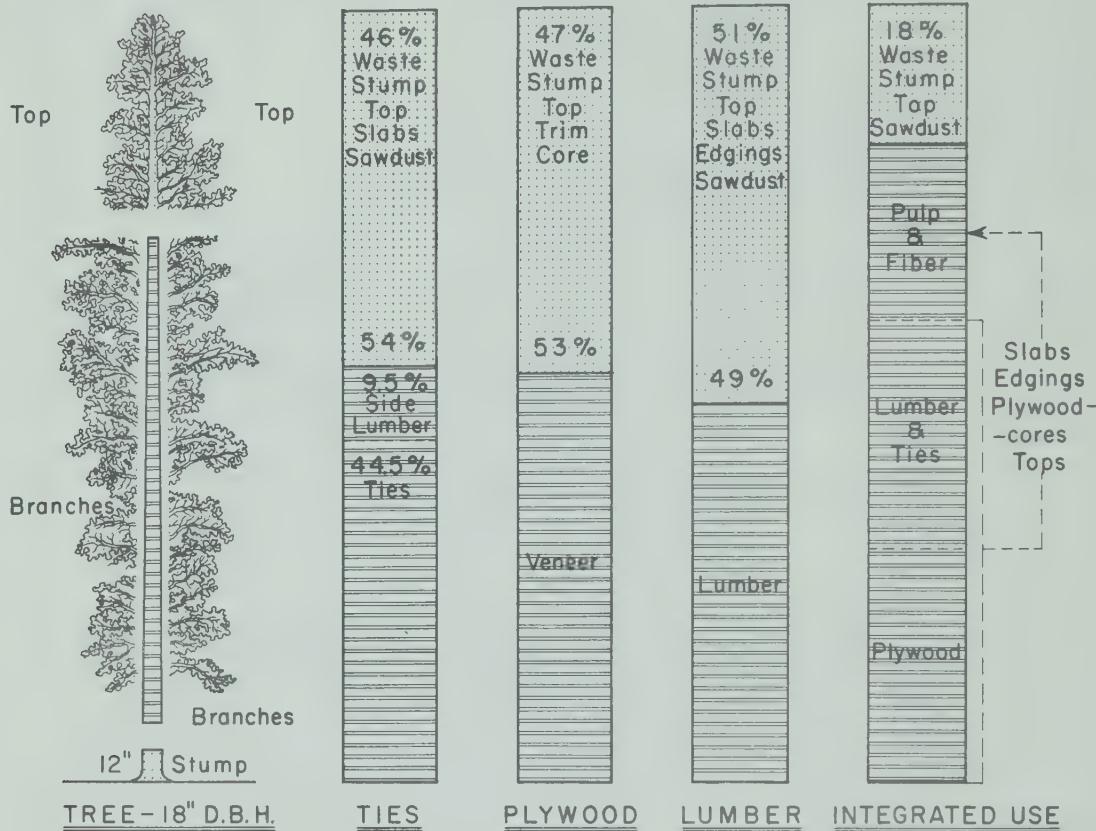
SODA	 ABOUT 40 %
------	--

WASTE: LIGNIN & UNRECOVERABLE CELLULOSE FIBERS.

ALBERTA  
ANNUAL PRODUCTION OF FOREST PRODUCTS

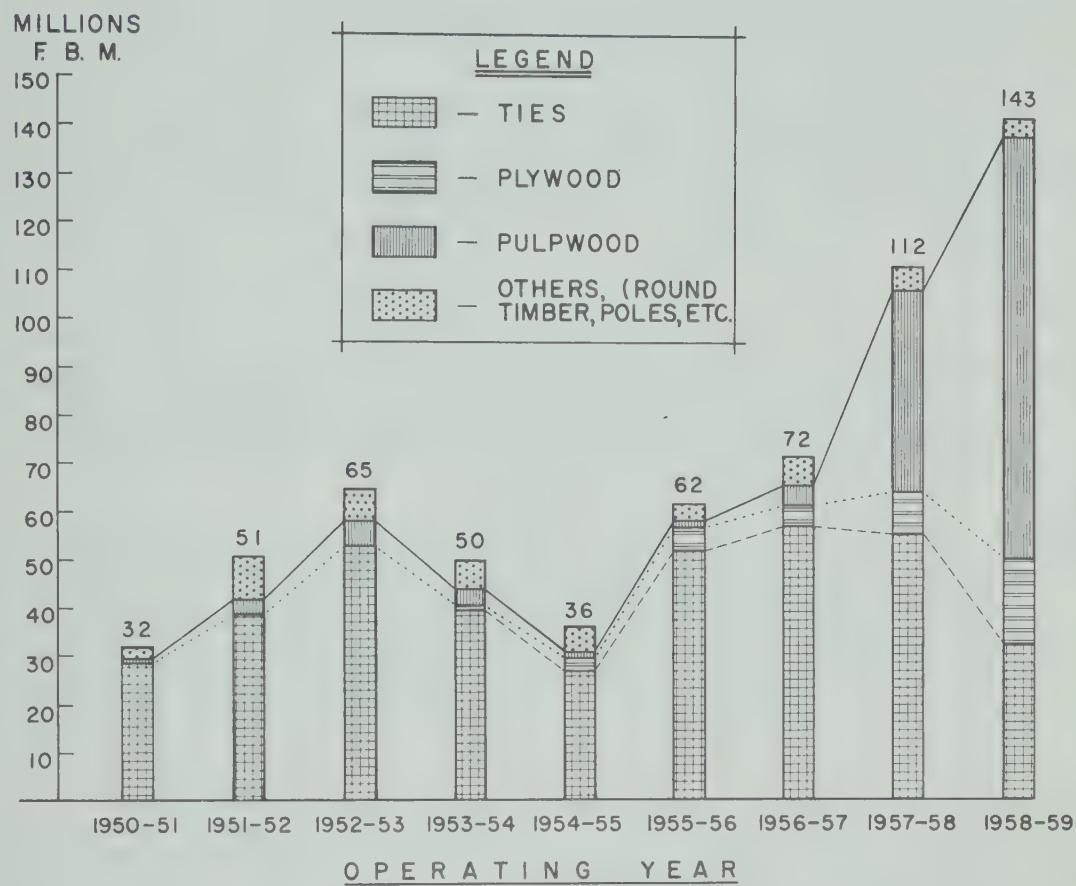


## UTILIZATION OF STANDING TREE



Percentage of Standing Tree Actually Utilized.

## ANNUAL PRODUCTION - PRODUCTS OTHER THAN LUMBER



## QUESTIONS

QUESTION: Has sawdust ever been used as a domestic fuel in Alberta? Do you feel that sawdust as a domestic fuel could compete with natural gas or oil fuel cost wise?

ANSWER: Sawdust has been used in domestic fields in several places. Cost wise it would be difficult to say. I do not think that is a contributing factor. For instance, if you went away for the weekend, your wife would much rather have a gas furnace than sawdust for convenience.

QUESTION: Has any progress been made to utilize the enormous waste of timber, especially white poplar which in the process of clearing land for agricultural purposes is being bulldozed into piles and burned at great expense.

ANSWER: Here you get into the question of economics. I have pointed out in my paper that we hope to get more plants to utilize poplar material. The pressed board plant at Wabamun has no timber of their own under licence. They purchase poplar timber from settlers cutting off their own land or cutting poplar timber from crown land under timber permit.

QUESTION: Mr. Hinman yesterday considered a helicopter out of line in comparison to value of forests. May I now ask: What percentage of stumpage fee is used for;

- (a) research
- (b) fire protection
- (c) actual fire fighting

ANSWER: (a) As far as research is concerned in 1930 it was agreed between the Provincial and Federal Governments that we would augment our services by working with them and sometimes doing work of our own. Generally speaking, the Federal Government pays.

(b) re: Fire protection. 1959-60 is the first time in history that the province is spending more money on this than it is receiving in revenue. We have come up to the point where we are spending more on forests than we are taking from them.

QUESTION: Where can these rugged males like Pierre be found?

ANSWER: We employ them in our Department.

QUESTION: Let's see the sample of wood you received.

ANSWER: This is one of the most important samples that can be sent in.

NOTE:- The last two questions refer to a bit of contrived  
by-play that interrupted Mr. Huestis' talk - - -  
in the interest of "Forest Protection."

Editor.



## "THE FUTURE OF WOOD"\*

K. G. FENSON  
Superintendent  
Forest Products Laboratories, Vancouver, B. C.

Wood is one of the most extraordinary materials used by man. This is not an original statement, but it is worth repeating and remembering. It is extraordinary in the sense that it would take volumes to tell about its use by and service to mankind, from early geological time down to the present atomic day and age. Perhaps the most amazing aspect of wood is that new uses are constantly being found for what is certainly one of the oldest materials on earth as witness the petrified log recently found beneath the bed of the Yakima River in the State of Washington and identified as being an extinct species of sequoia which grew and flourished on the earth's surface over twelve million years before the year 1 A.D.

Thirty years ago wood was said to have about 4,000 different classified uses. Today, it is known to have over 6,000 uses. And this increase in the number of items manufactured or shaped from wood fibre has taken place despite the fact that wood is now competing more intensively with more materials than it ever did in the past.

This applies to the spruces, pines and poplars of Alberta as it does to all woods, whatever their origin. Although Alberta is not one of the major lumber and pulp and paper producing provinces in Canada its estimated 38 million acres of productive and 26 million acres of potential forest land are a far more important natural resource than is generally realized by those who think of this province solely in terms of cattle, wheat, oil and coal. For instance, in the annual report of the Department of Lands and Forests of the Province of Alberta for the fiscal year ending March 31, 1958, it was indicated that --

- there were 806 active operations (timber berths and special permits).
- there were 30,000,000 ft. b.m. of lumber cut.
- there were 1,500,000 pieces of lath manufactured.
- there were 670,000 lineal ft. of poles and piling produced.
- there were 242,000 cords of pulpwood cut.

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\* A contribution of the Vancouver Laboratory of the Forest Products Laboratories of Canada, a Division of the Forestry Branch, Department of Northern Affairs and National Resources, Ottawa, Canada.

- there were 5,000,000 ft. b.m. of poplar plywood logs cut.
- there were 3,000,000 ft. b.m. of pine plywood.
- there were 1,600,000 railway ties produced.
- there were 10,000,000 lineal ft. of round timber produced.

These statistics show that the forest industries so contribute to the provincial economy that it would be difficult if not impossible to fill in the revenue gap in the event that they ceased to function. If, in addition, the total effect of forest influences be considered -- flood control, ground water supply, effect on climate, relationship to wildlife conservation and fish welfare -- it must be concluded that the forests of Alberta are of incalculable value, that every harvesting of the timber crop at the right time and place will pay off many times, that the elimination of even one wasteful utilization practice in the woods, mill or manufacturing plant will yield a rich dividend, and that there is great and unknown potential in presently undeveloped forest land.

However, wood as a material of commerce is so widely manufactured, distributed and used throughout the world -- and its ramifications are so complex -- that its future must be appraised in the light of international as well as local applications. Almost 70 per cent of the total lumber cut in Alberta is merchandised in the Prairie Provinces and the proximity of these markets will always constitute a favourable economic factor. The balance of the cut, mostly exported to the United States and to Eastern Canada, is subject to more intensive competition from both other materials and from lumber originating in other producing areas than is locally used lumber. What happens in demand and consumer trends in Eastern Canada and the United States, therefore, not only immediately and vitally affects the export market, but also after a time lag percolates through to and influences consumer trends in Alberta and the Prairie Provinces. Consequently any new developments in forest products production techniques, in use applications, and in basic or applied research -- if they be restricted to the area where they were discovered and applied -- will not create sufficient additional interest in and demand for these products on a world-wide basis to greatly improve their competitive position. It is only when such information is widely distributed and used that maximum potential benefits accrue to wood, no matter what the species or locality of production. The point which I am trying to make is that no one associated directly or indirectly with any forest products industry can afford either to disregard or be ignorant of what is happening to wood throughout the world. Sometimes having this latest up-to-date knowledge can properly influence key decisions as to product development and possible market and plant expansion. Sometimes it can make the difference between profit and loss.

This objective can be attained by the regular reading of a well selected list of specialist trade and semi-scientific journals, and exchange of opinion through the medium of personal contact and association membership. It can be attained by keeping a file of the publications of forest products laboratories and other research organizations whose functions are to accumulate data about the physical, mechanical, anatomical and chemical properties of wood. It can be attained by concerted, coordinated effort based on the most recent information available and widely distributed through every phase of forest products production. If there be constructive action along these lines it will be that much easier to find out what is the best type of forestry practice for a given area, what improvements in manufacturing and merchandising methods are indicated, what kind of product development should be undertaken, and how the public can be educated as to the advantages that wood has to offer.

Though wood, as has already been stated, has suffered severely from the competition of other materials, there is encouragement in that much progress has been made of recent years. Today there is understanding of wood which was non-existent not so many years ago. Many classes of users have been educated as to how to use it to best advantage. Raw material waste in the woods and in the manufacturing plant have been reduced, and new and attractive wood forms have been created. Grade marking and certification -- in other words the guaranteeing of lumber of certain specified quality -- have progressed beyond the discussion stage to the point where the Federal Housing Administration in the United States and probably Central Housing and Mortgage Corporation, its counterpart in Canada, will soon not be prepared to accept any lumber for construction that is not conspicuously stamped with the name of the sponsoring association, the mill, the species and the grade.

More wood is salvaged from sawmill slabs and edgings than in the past -- for pulp chips, for hardboard, for particle board, for dimension, and for many miscellaneous glued up products made possible by modern techniques (including radio frequency) of and edge gluing. The invention of particle board (chipboard, flakeboard, coreboard, etc.) in itself has created a vigorous new industry which ranks with lumbering and manufacture of pulp and paper and veneers and plywood among the largest forest products industries in the world. Sawdust and shavings are being widely utilized for molded products, wood flour, agricultural mulches, sweeping compounds, wallboard ingredients and others. Wax, dihydroquercetin, cork fractions and tannin are being extracted from bark. Wood is still being distilled for various acids, resin and turpentine, but in addition to these naval stores numerous complex chemical substances have been extracted and identified from different species of wood and are gradually being utilized commercially.

Progress has been made in manufacturing techniques. The invention of the whole-log debarker has been more responsible

for integration between sawmilling and pulp and paper manufacture than any other single factor. Automatic sawmill carriages, push button control of trimming, edging and sorting, mechanical dry-kiln loaders and unloaders, and other forms of mechanization have been successfully introduced, and are solidly established throughout the whole field of forest products manufacture. Cutting tools are supplied with new and more efficient carbides, and experiments have been conducted in respect to the elimination of saw kerf by the use of cutting wheels instead of saws.

Progress has been made in trade promotion and in adopting more modern merchandising methods. Wood furniture is being aggressively promoted, and one interesting result of this promotion is that wood is again being used extensively for T.V. and radio cabinets -- so much so, in fact, that woodworking machinery has been installed in plants where nothing but metal cabinets had been produced. Another forward and functional development has been the increased use of wood in combination with other materials. For such products as paper overlaid wood or plywood, flex veneer (veneer on cloth binding), plastic-faced panels, plywood having plys of wood and steel, paper and veneer packaging, boards made of excelsior and cement, aluminum and wood for exterior siding and numerous other products, the combination of favourable properties is unique and could not be duplicated in any one material. Complete assemblies of windows, doors and cabinets along with accompanying glass, hardware and other essential items are now being marketed. Hardboard, lumber, plywood and particle board are in many cases being prefabricated or machined and finished to customer specifications.

Integration has increased efficiency and economy in spite of rising costs of labour and raw materials. This has resulted in more wood volume per acre of forest land being utilized in the form of final end products. In addition to sawmilling being integrated with pulp and paper production, a number of other combinations have been developed, as for example, plywood with hardboard, plywood with particle board, lumber with plywood, lumber with furniture dimension and particle board, sawmilling with insulating board -- to mention only a few. Such integration has not materialized in all parts of the world, but it is highly developed on the British Columbia coast, and will continue to be developed in those areas in which diversified wood products can be profitably produced and marketed. Neither the interior of British Columbia nor Alberta offer as much in the way of opportunities for wood products integration at the present time because these areas are a long way from outside markets and lack the density of population required to support many-phased operations of this type. However, there is limited opportunity even in these latter areas, and future demand might change this picture radically.

So much for the present. What about the future? A few years ago the Weyerhaeuser Timber Company in the United States sponsored a survey of the status of wood products in that country.

This survey was undertaken by the Stanford Research Institute, Palo Alto, California, and part of the very comprehensive report which was subsequently published was a projection of trends and an estimate of how future markets in 1975 would be affected by these trends. As conditions in Canada -- living standards, trade patterns, social structure, etc. -- are comparable to those in the United States in many ways, it might be useful for purposes of this discussion to review some of these findings.

Firstly, it was predicted that there would be a population growth of from 160 million to 212 million in the U. S. A similar growth in this country would bring our population from its present 17 million level to 21 million, and it is estimated that the world's population will double by the year 2000 to about 6 billion. Whether or not there be a population explosion in this order of magnitude, there is no doubt but that this earth is rapidly becoming more densely populated and that more of almost everything that is being grown, harvested, manufactured or constructed will be required in the coming years. It is even possible that our world as we know it may not be able to feed, house and support these additional millions, and that many of the more venturesome will head off into space bound for new planets and galaxies.

In 1953 when the Stanford Research Institute conducted its survey, lumber production accounted for 73 per cent of the total wood consumption in the U. S. Seventy per cent of this lumber went into construction and the remainder into shipping materials and containers, and 50 per cent of the lumber going into construction was for new construction. It was predicted that construction would increase by 23 per cent in the period up to 1975 because of population growth, more suburban homes and communities, better home financing, and higher standards of living. However, the lumber used in residential construction is expected to decline by 20 per cent, while it was predicted that there will be a 45 per cent decline in the quantity of lumber consumed per dollar of non-residential construction.

It was predicted in terms of demand that corrugated containers will double by 1975, plywood and veneer containers will increase by 90 per cent, wooden boxes will increase by 25 per cent, pallet construction will increase by 100 per cent, multiwall paper sacks will increase by 133 per cent, and that fibre drums will increase by 400 per cent.

A particularly interesting prediction was that wood pulp, paper and hardboard consumption will increase at rates more rapid than that of the general overall economy. For instance, the demand for paper is expected to increase by 70 per cent, paper board 85 per cent, newsprint 43 per cent, and wood pulp 100 per cent. Gains were predicted in the use of hardboard for interior wall surfacing and for ceiling surfacing -- from 1 to 5 per cent and from 2 to 8 per cent respectively of the total market. Gains were also predicted in the use of hardboard for roof sheathing, doors, cabinets and trim. An

increase of 125 per cent is expected in the amount of pulp used for rayon, acetate, cellophane, lacquers, plastics and film. These anticipated trends are of special significance to the forest products industries in Alberta as being indicative of possible new manufacturing combinations.

It was predicted that lumber production will increase 7 per cent to a total of 41 billion feet by 1975, but that the consumption of lumber in the United States will rise to 45 billion feet - 4 billion feet in excess of the local supply in that country. Of particular interest to Canada was the prediction that much of the difference between production and consumption will be provided by this country.

It was predicted that the manufacture of furniture will increase by 100 per cent, and fixtures by 80 per cent in this period.

The cost of lumber production was noted to be rising more rapidly than the general level of prices of competing materials. It was expected that this trend would continue, and that lumber would price itself out of some markets. Mainly for this reason the projection in respect to lumber was not quite so favourable as those having reference to most other forest products. For example, it was anticipated that the price of wood pulp and paper products would continue to be competitive up to and beyond 1975.

On the debit side it was predicted that the demand for slack cooperage will neither increase nor decline, while that for tight cooperage will decline.

What does all this add up to? These predictions of the Stanford Research Institute are not necessarily correct. They may or may not materialize depending on factors quite beyond the control and knowledge of the researchers who compiled the data. At the time this report was prepared it could scarcely be imagined that a sphere would be put into orbit around the moon in 1959, and that photographs of the moon would be flashed back to earth from an intricate, ingenious and previously unheard of combination of equipment. Science is moving so fast these days that almost any kind of prognostication about the future could be very wide of the mark.

There is so much that is still not known about wood that the undertaking of more research is a "must" if new uses for it are to be found and the position of old uses consolidated. For instance, no completely satisfactory and reasonably priced exterior finish that will preserve the natural colour of wood has been developed. No cheap process has been devised for making wood dimensionally stable. No method has been invented for accurately measuring the smoothness of wood surfaces. The application of ultrasonics to the testing

of wood is in its infancy, and in this field alone there are opportunities for non-destructive testing and for detection of hidden defects and abnormalities that, if realized, would greatly increase the efficiency and suitability of wood products. Only a few of the answers have been found in respect to protecting wood from fire, moisture, insects and disease. The effects of radiation on the reactions and performance of wood are practically unknown, and only limited data are available as regards the effect of various ecological factors on the quality of wood. The causes of variations in properties between different parts of the same tree and adjacent trees remain obscure, as do the causes of many stains in lumber. The exact structure of lignin has not been determined, and there are a host of chemical substances in the wood and bark of most species of wood which have as yet not been identified. Although wood has been examined for anatomical features under hundreds of microscopes, the exact path followed by vapours and liquid as they move through wood cells has not been detected. Methods of fireproofing wood are effective but far too expensive for other than specialty use.

If answers are found to these problems it is possible and even probable that the future demand for lumber and forest products generally will exceed all predictions. And conversely, if answers be not found, the Stanford Research Institute's report might prove to be wildly optimistic. What is indicated most clearly is that expanding populations the world over are presenting wood with an opportunity that could make the 1960's the golden age of wood. It is equally apparent, however, that this opportunity cannot and will not be realized unless there be a constant search for new markets, for new ways of doing, and for new understanding as to how to utilize this tremendous natural resource more effectively and economically.



## "PULPWOOD UTILIZATION IN ALBERTA"

D. I. CROSSLEY

Chief Forester  
North Western Pulp and Power, Hinton

At the completion of the Alberta Forest Inventory in 1956 the Provincial Forest Service obtained the initial statistics necessary for the proper and orderly management of the forest resources under its jurisdiction. One of the interesting and important facts that arose from this inventory was the confirmation of the previously held suspicion that the preponderance of forest growth within the Province is more suited by size for pulpwood harvesting than it is for lumber. Allow me to illustrate this by the presentation of stand and stock table data that are the result of an intensive inventory sample of a half-million acre unit, held under lease by North Western Pulp and Power Ltd. in the Hinton area.

TABLE I  
STAND TABLE OF MATURE CONIFEROUS STANDS  
IN THE McLEOD WORKING CIRCLE

WHITE SPRUCE

	Total Number of trees/acre	% of Total below 5.5" d.b.h.	% of Total 5.6" - 11.5" d.b.h.	% of Total 11.6" d.b.h. +
Living trees	337	13	69	18
Standing dead	49	21	69	10
Total	386	14	69	17

BLACK SPRUCE

Living trees	291	45	54	1
Standing dead	26	28	70	2
Total	317	43	56	1

MIXED SPRUCE

Living trees	211	19	61	20
Standing dead	34	22	62	16
Total	245	20	61	19

FIR

Living trees	309	14	71	15
Standing dead	60	8	74	18
Total	369	13	72	15

LODGEPOLE PINE

		5.6" - 9.5" d.b.h.	9.6" d.b.h. +
Living trees	425	30	59
Standing dead	61	31	69
Total	486	30	60

TABLE 2  
STAND TABLE OF MATURE CONIFEROUS STANDS  
IN THE McLEOD WORKING CIRCLE

WHITE SPRUCE

	Total Softwood Volume in cords /acre	% of Total below 5.5" d.b.h.	% of Total 5.6" - 11.5" d.b.h.	% of Total 11.6" d.b.h. +
Living trees	42	1	48	51
Standing dead	3	4	62	34
Total	45	2	49	49

BLACK SPRUCE

Living trees	11	16	76	8
Standing dead	1	8	84	8
Total	12	16	76	8

MIXED SPRUCE

Living trees	25	2	43	55
Standing dead	3	2	42	56
Total	28	2	43	55

FIR

Living trees	34	2	50	48
Standing dead	5	1	59	40
Total	39	2	51	47

LODGEPOLE PINE

		5.6" - 9.5" d.b.h.	9.6" d.b.h. +
Living trees	30	7	57
Standing dead	3	11	89
Total	33	8	59

From a careful examination of the Provincial Inventory data the Department of Lands and Forests has concluded that there are at least four forested areas (over and above that already under Lease to North Western Pulp and Power Ltd.) that are particularly suited to the production of pulpwood. One of these regions lies in the Lesser Slave Lake watershed, another is the territory south of Grande Prairie, a third lies to the northwest of Peace River Town in the Clear Hills, and the fourth north of the Athabasca River at Whitecourt. Mention is also made of the possibility of a fifth potential pulpwood area in the Rocky Mountain House region. In round figures these would cover something in the neighborhood of 30,000 sq. miles, or 25% of the forested land in Alberta.

From the one unit presently under management for a sustained yield of pulpwood, sufficient information is presently at hand to warrant the presentation of a comparative picture between pulpwood utilization and stand utilization for other forest products, with particular reference to lumber.

In order to present the picture as it is developing at North Western it is first necessary to explain the system of silvicultural management that has been adopted. A similar system may or may not apply in other forest areas within the Province, depending upon the nature of the timber stands, how they originated, and upon the particular philosophy of the forestry department charged with management.

On North Western's limits we have found our stands to be of fire origin and therefore they are essentially even-aged. Nature successfully reproduced these stands after a cataclysm - in this case, complete destruction from wild fires. (Colored slides of age class distribution in Marlboro Working Circle shown). Our Forestry Department is attempting to take a leaf from nature's book by cataclysmic destruction of the stand, but in this case, accomplishing it with the axe rather than with fire. (Three photos of strip cutting, patch logging and clearcutting with scattered seed blocks shown).

We have illustrated these clearcutting systems because this method of timber harvesting has a definite bearing on utilization standards, and their original adoption had this in mind when a decision had to be made on the best silvicultural system to be adopted. Clearcutting obviously permits our Company to consider the utilization of everything that the land is supporting, bearing in mind the physical limitations of our log handling equipment. Present utilization standards at the lower size limits permit cutting of standing trees down to the 6" d.b.h. class (or 5.6" d.b.h.) and to a 4" inside-bark top diameter. These lower limits are dictated by the economics of small log handling and by the physical limitations of the barking drums in the woodroom. No upper limits of pulpwood utilization are set. The throat of the chipper in the woodroom will not accept a bolt larger

than 18" in diameter, but logs in excess of this can be broken down beforehand to acceptable size.

Referring to Tables 1 and 2 it is apparent that while our mature and overmature stands contain an appreciable number of stems below the lower level of merchantability for pulpwood (5.5" d.b.h.), particularly in the case of both black spruce and lodgepole pine stands, very little wood volume is lost through non-utilization, and there is little incentive for us to make serious attempts to lower our cutting diameter limits at the present time.

All timber stands, regardless of age, contain dead and dying trees as a natural process of stand development. In our comparatively dry and cool continental climate cellulose deterioration from rot is very slow and as long as a dead tree remains standing we find that it is usually sufficiently sound to be useable in our sulfate pulping process. The average volume of dead wood harvested in about 10% of the total, and results in a considerable return to the Company in wood volume per acre, and to the Crown in the form of stumpage.

All coniferous species are extracted from our pulpwood stands with no preference being shown, which is not the case in sawlog extraction where most operators resist the cutting of fir, and where black spruce, due to its usual small size, is seldom harvested. In addition cull for any reason, and that includes stain, rot, cat faces, sweep, crook, shake, etc. is at a minimum when harvesting pulpwood when compared to most other forms of wood utilization. To illustrate, during pulpwood harvesting no deduction is made by our scalers for wood discoloration and stain, while in both lumber and tie operations these can be an important reason for reject. A pulpwood bolt containing rot is considered a cull only when 50% or more of its total volume is defective. While extensive sweep and crook are unacceptable in a pulpwood bolt as they are in a sawlog, the fact that in lengths of 100" as compared to almost double that length in the usual sawlog, acceptable bolts can be sawn out of crooked trees that would have to be rejected when harvesting the longer sawlogs.

As mentioned previously in this paper, pulpwood utilization in the felled trees is down to a 4" top. Utilization standards in most other forest products are to a 6" top. While the increase in volume through greater stem use is only in the neighborhood of 4%, nevertheless it is on the credit side of the ledger and is therefore advantageous both to the Company and the Crown.

Since such small diameters can be utilized for pulpwood it is obvious that mature stands of small average diameter can be harvested for this product that elsewhere are left untouched. Stand density and site conditions often have a bearing on average stem size, and this is particularly true when considering lodgepole pine which usually grows denser than most other species, and black spruce

which often inhabits wet sites where growth is slow (see Table 1). In spite of the effect of density and of excessive soil moisture on average stem size the volumes per acre can be impressive and well worth harvesting (see Table 2).

Throughout the whole forested area of the province many stands of overmature timber exist that have reached a stage of deterioration where they are not attractive to most timber harvesters. Gross volumes per acre may still be good but net volume for sawn products becomes uneconomical. Because of its greater tolerance to defect a pulpwood operation in such stands remains economical and therefore attractive. From a forest management point of view the ability to harvest such stands for pulpwood has the added advantage of getting acreages back into the production of thrifty young stands without have to resort to expensive land clearing operations necessary for the destruction of decadent wood materials.

Cutting of wood for its fibre content rather than for its board foot content results in further pronounced savings in wood volume. In a typical sawlog operation over 4% of the felled tree remains in the bush in the form of non-merchantable tops and from culled material resulting from the long butting, sweep and crotch. Such losses are small when compared to the milling losses of 50% of the individual log which generally go to the burner in the form of slabs and edgings (30%), sawdust (15%) and trim (4%). In the final analysis only 48% of the average felled tree reaches the market in the form of rough lumber. Since dues are paid only on this product the stumpage returns to the Crown are correspondingly effected.

Wood losses are of course also incurred in a pulpwood operation, but as has been explained previously they are kept to a minimum by close utilization in the woods. Fibre loss during manufacture into chips is confined to a small loss due to end-brooming as the bolt tumbles through the barking drums, and to the elimination of fines as the chips pass over the screens. The average pulpwood tree yields 96% of its volume after felling to the mill digesters.

Figure 1 illustrates the comparison in utilization between an average tree when converted into lumber or into chips. However, from what has been previously said about stand harvesting as compared to single tree harvesting, it is obvious that the complete story about such comparative wood utilization can only be demonstrated by comparing per acre wood returns. Figure 2 attempts to present the comparative wood yields from a fictitious C4SwFa stand, assuming a clear-cutting operation in both cases. While some assumptions were made here that may not be strictly accurate I think we are safe in saying that the harvesting of wood in the form of chips results in three-fold wood returns when compared to harvesting in the form of lumber.

FIGURE I

Single Tree Utilization

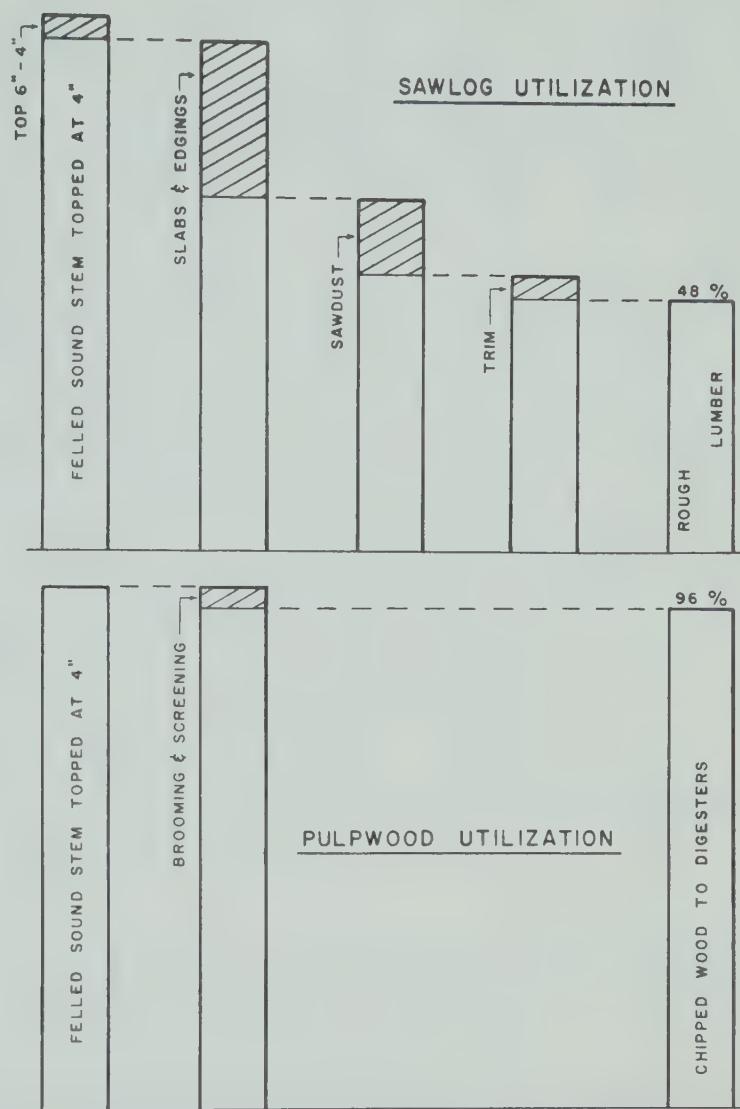
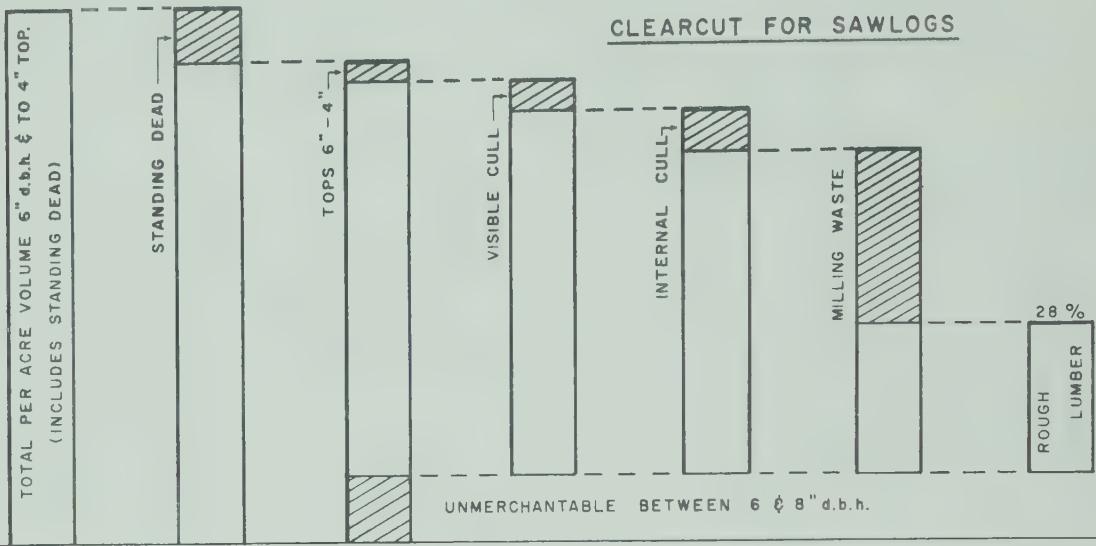


FIGURE 2

## C4SwFa Stand Utilization



I cannot leave this subject of wood waste without bringing to your attention an interesting comparison recently drawn by a prominent Consulting Forester, who, with tongue in cheek, found it difficult to reconcile the public perturbation aroused by huge timber losses from forest fires with the complete apathy that appears to exist over similar huge fire losses continually going on in approved burners of materials sorted out on the green chain.

This dissertation on pulpwood utilization within our Provincial boundaries cannot be complete without referring to the chipping of sawmill wastes. Your attention has already been drawn to the large percentage of wood that generally goes to the burners in the form of slabs, edging and trim. One moderate-size sawmill within the Province has recently equipped itself with a whole log barker, chipper and screens, and a storage hopper, and is presently supplying the pulp mill at Hinton with acceptable chips from its slabs, edgings and trim, at the rate of 1 unit (200 cubic feet) per thousand f.b.m. of sawn lumber. True, this mill is advantageously placed within an economic hauling distance of the mill and can apparently compete with chips produced in our own plant. It would be to everyone's advantage if more of this waste wood within the Province could be so converted. Sufficient chip volume to justify the capital investment for the specialized equipment required is essential, as well as an economical hauling distance to minimize transportation costs. The latter will generally be found to be the limiting factor. However, such utilization will undoubtedly increase when other pulp mills become established within the Province.

In setting up the original Agreement between North Western Pulp and Power and the Crown a wise provision was made allowing existing L.T.B. holders operating for lumber, ties, etc. to top their trees at 9" diameter rather than the customary 6", provided that the resulting top is converted into pulpwood to a 4" top. The top log is generally considered a sub-marginal unit anyway, taken only in the interest of wood conservation. The lumber and tie operators are usually only too pleased with such a regulation, and the Crown also derives benefits. This regulation has subsequently been altered to include certain operators outside the boundaries of the Pulpwood Lease Area, and its adoption will no doubt be governed by hauling distance and volumes involved.

In conclusion I would like to point out that the Alberta Forest Inventory indicates a dearth of suitable mature timber stands presently available for lumber and tie operators, and at the same time it has also been indicated that our forests are being undercut. This anomaly is due mainly to the size of timber we are growing. The only way the total growth can be cut is by extending utilization to smaller timber. Pulpwood utilization is one obvious answer.

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## QUESTIONS

QUESTION: Is hunting and fishing permitted on Company land?

ANSWER: Definitely yes! Our Company is committed to the principle of multiple use.

QUESTION: Do you think that, by using portable debarkers, utilization of the small material now being left will be economical in the near future?

ANSWER: Yes, Considerable research is going on now on debarking trees in the woods, chipping at that location and transporting the chips by water, particularly in plastic chips. This will permit chipping to smaller size classes in the woods and will result in greater volumes being removed and in large savings in transportation costs.

QUESTION: To what extent is contour stripping practical in your operations?

ANSWER: Very practical. - In our rougher cutting areas which are located on the western edge of our limits bordering Jasper National Park. We are presently contouring such rough terrain at two foot contour intervals and this will permit us to lay out our cutting strips with contouring in mind.

QUESTION: The economics of hauling sawmill waste and treetops for utilization in your pulpmill are governed by distance. What is the limit of this distance?

ANSWER: We don't know. The one mill now salvaging such material is some 15 miles from the mill and the economics of its operation are not yet certain.

QUESTION: Is there any procedure for thinning out new growth for producing fewer larger trees?

ANSWER: This is known as high yield silviculture and is not generally considered economical yet in this country, simply

because we can use the small materials that would be removed in the thinning operation and there will be nothing to bear the cost of such expense. However, we are doing experimental work along this line and have undertaken such thinning in our black spruce area. At some future date such operations may become practical. At the same time we are experimenting in our dense lodgepole pine stands in which we are attempting to increase the growth of selected trees by the application of fertilizers around the base. If this is successful, the fertilized trees will be allowed to proceed to maturity and it is our hope that the greater number of remaining unfertilized trees will die.

QUESTION: Clear cutting of large blocks or strips of forest will no doubt encourage faster snow melt rates. Do you anticipate less uniform stream flows and increased siltation of streams as a result of such operations?

ANSWER: Yes. But at the same time increased water yields should result. In clear cut patches, the snow is allowed to fall to the ground rather than being held up in the branches where much of it is lost to evaporation. We do not anticipate much erosion on the type of soil on which we are cutting because we have seen little indication of it in the past. We leave considerable debris on the ground after cutting in the form of branch tops, roots, etc. and this appears to hold the soil and prevents serious erosion.

QUESTION: Why are the 12" stumps left after the trees have been cut? Are they left there for a purpose?

ANSWER: A 12" stump is accepted in this part of the country because at the utilization of levels practised it is uneconomical to cut lower. The cutters themselves would refuse to cut at a lower level as it would reduce their rate of production and therefore their earnings. In the wintertime they would also have to carry a shovel in order to cut at such levels. But swell also makes scaling more expensive and loading and hauling more difficult and more expensive also.

QUESTION: What are the requirements of the pulpmills to avoid pollution of waters? And are these requirements being met?

ANSWER: At the outset of my talk I specified that my paper was confined to timber extraction and the woods end of our operations and that I was neither qualified nor prepared to talk on the manufacturing aspects in the mill. Such information can be obtained from the representatives who are with the pulpmill display in the lobby. However, the requirements laid down in the agreement between the Government of the Province of Alberta and North Western Pulp and Power Ltd. are as follows:

"The Company agrees that it will employ the necessary techniques, methods, and devices required to safeguard the public from any deleterious effect which may result from the pulping process, and the Company further agrees that no deleterious matter of any kind which is injurious to fish life shall be placed in any river or other waters without the consent of the Minister."

In addition our Company has a letter from the Minister of Health outlining the requirements referred to above. I do not know what these requirements are.

When starting a new mill a considerable period of time is necessary for breaking in. At this time considerable losses in chemicals and wood waste occur and a proportionately large amount may be allowed to enter the major water source. However, our planned mill operation has as one of its major features the recovery of chemical wastes and this exceeds 90% so that the chemicals are used over and over again in the process and little is allowed to enter the effluent pond. Now that our mill is in full operation we are meeting new standards and less chemicals are being lost and no wood. The effluent enters the settling pond and remains there for three days during which the waste is oxidized before proceeding to the Athabasca River.



## "COMMERCIAL FISHERIES UTILIZATION"

W. A. KENNEDY  
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The Inland Commercial Fisheries of Canada are generally regarded as a relatively small part of the total Canadian Commercial Fishery. Canada produces annually about two billion pounds of fishery products including lobster, oysters and other shell fish. Of this, only about 6% are fishery products from the inland fisheries. However because the fresh-water fisheries are more favorably situated for marketing their products, the value of the inland commercial catch is a larger proportion of the whole. The annual freshwater catch is valued at \$13,000,000 landed and \$20,000,000 as marketed, or 13% and 10% respectively of the values of the total Canadian catch. In terms of people involved, the freshwater fishery is an even larger fraction, since there are about 16,000 commercial fishermen in our inland fishing, or about 22% of the total number of Canadian Commercial Fishermen. Looking at it another way, close to one Canadian in every thousand is a fresh-water commercial fisherman, and he is generally the main bread-winner in a family.

Detailed maps of northern Canada show a tremendous number of lakes, particularly in the Pre-Cambrian Shield. Most of the lakes have commercial species of fish in them. However, commercial fisheries are mostly confined to those lakes near roads and railroads. Although not fished commercially, the more remote lakes are an important source of food for men and sleigh dogs in those areas.

The most important species of Canadian freshwater fish is the whitefish of which \$24,000,000 pounds with a marketed value of over \$6,000,000 are taken annually. Next in importance is yellow walleye of which 17,000,000 pounds with a marketed value of \$4,000,000 is taken annually. Third in numerical importance, though only seventh in importance by value, is cisco, which name is used to include tullibee, lake herring, chubs and similar fish. Fourth in numerical importance, is blue walleye which is produced almost exclusively in Lake Erie. It is only on the basis of long-term averages that this species is fourth; for the past two years production has been very low. Other species in order of quantities produced are, pike, perch, lake trout, sturgeon, sauger, carp and catfish. This is not a complete list, but does include all species of which 1,000,000 pounds or more are produced annually.

A variety of fishing gear is used by the commercial fishermen. The most commonly used type is the gill net, which is made of threads so fine that the fish do not readily perceive it is in the water, and in which they become entangled. Weights along the bottom

of the gill net hold it down, generally on the lake bottom, and floats along the top keep the net vertical. If the lake is ice free, gill nets are generally payed out from a boat in a long line, left over night or longer, then pulled aboard, fish and all. The fish are then disentangled, and the nets reset. Gill nets are also set under the ice. Holes are cut in the ice and a rope is passed from one hole to the next by various means, then used to pull the gill net into place.

Fish are also caught in various devices which are designed to lead them through narrow openings, into enclosures of heavy netting from which they cannot readily get out again. Three variations of this type of net which are used in fresh waters are the pound net, the trap net and the fyke net.

In a few places, beach seines are used. A beach seine is set out parallel to shore, then long ropes which are attached to either end are slowly drawn ashore until the fish are completely enclosed between the beach and the seine.

Very recently, several fishermen on Lake Erie have started to use otter trawls. Otter trawls are dragged along the bottom where they engulf fish. The action of water on the otter boards causes them to pull sideways on either side of the net, which holds it open horizontally while floats on the top of the leading edge of the net hold it open vertically. After being dragged for approximately one hour, the trawl is taken aboard and the fish are poured out on deck.

A major part of our commercial catch of freshwater fish are sold in the United States. Chicago, Detroit and New York are the main markets with which Canadian producers deal. About three-quarters of the catch are sold as "fresh fish" -- that is they reach the wholesaler packed in ice, and otherwise unprocessed, except that the viscera may be removed. The remainder are sold frozen. About half of the frozen fish are sold whole or eviscerated only, the rest are sold as frozen fillets. A very small proportion of the catch, less than 1%, are sold in other forms such as, smoked fish or as canned fish.

An outstanding feature is the extent to which fresh-water fish are not utilized. There are hundreds of lakes in northern Canada that are exploited only lightly, or not at all because inadequate transportation makes it impossible to fish them. Furthermore, in many cases, legal restrictions prevent lakes from being exploited to their full capacity. Finally, the price received for certain species is so low that their actual production is small compared with potential production. If there were sufficient incentive for taking ciscoes, particularly the ciscoes of the Prairie Provinces which are generally known as tullibees,

probably the Canadian production of fresh-water fish would be at least tripled. We use only a small part of our potential production of the various species of suckers, of burbot and of smelt. We make no use of species such as alewives, gizzard shad and of the many species of minnows. All in all, we are using only a small part of our fresh-water fisheries resource, and under present conditions, are not likely to do so. However, as the world's population and particularly Canada's population increases, we will certainly utilize a larger proportion of the resource. The protein hungry countries of the world who are looking to the sea for more food are rapidly increasing their fishing potential. They will indubitably fish much more heavily on those parts of the high seas which Canada has always regarded as her fishing grounds. This in turn will inevitably increase the importance of our fresh-water fisheries.

Increased utilization depends partly on increased demand for the product. There is a steadily increasing demand in North America for food packaged in a ready-to-cook form. To sell more fish the fishing industry should take full advantage of this trend to put on the market a product, not necessarily distinguishable as fish, that is artificially flavoured and ready for the pan. Technologists of the Fisheries Research Board have developed at least two items, fish flour and fish sausage, which could be the starting point for developing such a product. The objective should be a product in which taste and texture are so disguised that the species of fish used would be immaterial.

Increased utilization would also be facilitated by the development of new types of fishing gear. As a step in that direction, the Fisheries Research Board is co-operating with other agencies in an experiment with a midwater trawl in Lake Erie as a means of catching smelt which cannot be efficiently exploited with the gear now available. The Board will also participate in experiments with purse seines and Danish Seines for the same purpose.

Our Commercial fishermen are, and always have been, essentially hunters of wild fish. We do not attempt to rear domesticated fish for market, but it seems very likely that we will develop the utilization of fish in this way as a commercial venture.

## QUESTIONS

QUESTION: How is the hydatid or tapeworm condition spread in fish. Particularly in the north where it is causing death to dogs?

ANSWER: The condition where tapeworms come from fish does not cause any appreciable death to dogs. The other one which fish get from dogs is known as diphyllobothrium acquired by fish from warm blooded animals. It gets back to the fish in dogs hair which happens to fall in the vicinity of lakes. Microscopic organism is eaten by the fish and then in turn by the dogs. I would like to emphasize that fish normally host many species of tapeworm. Each has its own cycle. Eggs are hatched in open water, eaten by fish, fish eaten in turn by animal and thereby completing the cycle.

QUESTION: Will the sixty-seven million dollar salmon industry be inevitably ruined through the creation of dams on the Fraser River, B.C. ?

ANSWER: I am afraid I am not in a position to answer this question but to quote my friends on the Pacific Coast, I feel that should dams be put on the Fraser River it will have a serious effect.

QUESTION: Are "echo-sounders" being used or tested in conjunction with Otter or Mid-water trawls to help locate fish in the Great Lakes? If so, with what success?

ANSWER: We do have two "echo-sounders" which we use in connection with trawls and we have found it an essential part of the Mid-Water Trawls. We must determine where the fish are located to know where it is right to pull the trawl. Fishermen on the Coast also use echo-sounders, but of a different type.

QUESTION: Re: Use of Western Drag to be tried on Great Slave Lakes.

ANSWER: To the best of my knowledge there are no plans at present for trying to drag net on the Great Slave Lakes, but I would be very glad to discuss the possibility with the person who asked this question.

QUESTION: What is the effect of the Lamprey Eel on commercial fishing at this time?

- (a) What is the latest method of controlling the Lamprey Eel?
- (b) How far has the Lamprey now travelled inland?

ANSWER: The lamprey has had a very serious effect on the lake trout in the Great Lakes. Trout fishing in the Great Lakes has dropped considerably. In one year in Lake Michigan it dropped from 6½ million to 0 and in Lake Superior from 4½ million to 1½ million and shows signs of dropping further. There is no indication that species other than lake trout have been reduced greatly by the lamprey. There is one sad effect by killing off the lake trout, the ciscoes have increased greatly in abundance. The amount of living protein in the Great Lakes had increased before the lamprey came in. Fishermen on Lake Michigan do not want lake trout back because they are doing better with ciscoes.

- (a) We started off using electrical devices which electrocuted them as they reached the spawning grounds. We are still only experimenting with chemicals that will kill only lamprey and not the other fish. If the concentration is mixed properly, and this is very tricky, because if the concentration is too strong, it will kill both, if not strong enough it will kill neither. It should be put in in the spring and kill them off before they grow too old.
- (b) The lamprey so far has invaded all the Great Lakes. It is not found in Lake Nipigon, Lake Nippising and the Muskoka Lakes. It is found in a few very small lakes on the northern part of the Michigan peninsula.

QUESTION: To what extent does unfavourable publicity i.e. fish tape-worm, etc. affect the consumer's buying habits?

ANSWER: This is very difficult to answer; I am afraid if I do answer I would only be guessing because nobody has ever made a survey to get information on this point. My guess is that this is not the main reason for people not buying fish.



## "AESTHETIC UTILIZATION OF THE WILDLIFE RESOURCES"

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The title of my paper could suggest to some that my remarks would be confined to such things as wildlife photography and bird-watching. I was told, however, that such a title could be used as a peg upon which to hang a cloak of any cut. My remarks, then will attempt to point up the direct and indirect values of wildlife and to set forth some of the major tasks facing Canada in that field today.

Let us first agree that the sport fish and other wildlife resources need make no apology for their contribution to our economy. We are plagued by lack of exact figures for expenditures in Canada in pursuit of fish and game. However, surveys in British Columbia in 1954 and 1955 indicated an annual expenditure on those pursuits of 32 million dollars, with an average annual expenditure per angler and hunter of \$128. There have been estimates for both Ontario and Quebec suggesting annual expenditures of 80 to 100 million dollars in pursuit of fish and game. Those figures, when compared carefully with the 1955 figure for the United States of 3 billion dollars, suggest that 300 million dollars is not unrealistic as a base figure from which to work - a figure that compares favourably with our commercial fishing industry. This figure does not, of course, include the indirect contribution to other recreational use of our lands and waters - a use now recognized as representing one of our major renewable resources.

No figures are available for the poundage of sport fish caught annually. However, a country-wide survey of hunting, reported upon in 1952, indicated that that sport provided 48½ million pounds of meat annually for Canadian tables. I will let you place your own valuation upon that meat since tastes vary, but I think you will agree the contribution is substantial. For comparison, landed value of commercial fish in 1954 was in the neighbourhood of 100 million dollars.

Raw furs, an important product of any wildlife management program, make a considerable contribution to our economy, the more so because much of that resource comes from areas otherwise unproductive. The value of raw pelts in 1957, according to the Dominion Bureau of Statistics, was just over 11 million dollars.

There are many indirect economic values of wildlife, though these are hard to evaluate in dollars and cents. Insect eating birds provide an inestimable service, while both birds and mammals

prey on rodents of various types. Bees are essential for the pollination of many of our plants; earthworms contribute mightily to our soils. It is certain that the whole living complex of the animal world contributes to our well-being far beyond our present ken.

While these facts and figures are significant, they fail entirely to present another very real value of fish and wild-life to the Canadian people. Most will agree, I think, that man's life is not made up solely by the abundance of things he has about him. Indeed today we suffer under the tyranny of things, of gadgets deemed necessities. It is that very tyranny of things, I suggest, the outgrowth of our present-day standard of living, that is driving us more and more onto the highways and to the lakes and streams.

Mr. Laurence Rockefeller, Chairman of the Outdoor Recreation Resources Commission set up a little over a year ago in the United States, states it this way: "We can recognize as a sign of our reaching maturity as a people that this attitude (that recreation is a waste of time) is beginning to change. ...We are beginning to recognize that outdoor recreation - as a healthy, satisfying, and often creative use of leisure time - has evolved from a luxury of a few to a necessity of the many." There has been a continuing diminution of physical need for the products of the hunt, but there are strong evidences, I believe, that as we become more highly organized, we show a growing mental and spiritual need for contact with the wild. Certainly there is a growing body of thought that our amazing technological advances, so well exemplified by moon rockets but equally evidenced in the gadgetry around us, have far outstripped (and indeed now threaten) our advances in social and spiritual welfare. We need to reappraise our situation, and insist that technology shall be the tool, not the master.

If we agree that there is not only a place for wild-life now and in the future, but an urgent need for it and the environment within which it thrives, what then are the problems that confront us? These are legion, but perhaps I can mention just a few that seem to me of paramount importance.

Certainly the population increase on this continent, combined with the increasing demand for outdoor recreation, is a number one problem. In Canada our population increased from 14 million in 1951 to just over 16 million in 1956 - an increase of 14.8%. However, attendance at our National Parks increased from 2,016,797 in 1951-52 to 3,529,976 in 1956-57 - an increase of 75%. Projection of the increase in National Parks use over the past several years indicates that by 1966 the visitor use could be 8 to 8½ million. It must be recognized, of course, that there are many variables involved, and many influences - thus the figure proposed should only be used to indicate the relative magnitude of our problem.

It has long been my contention that we cannot and should not attempt arbitrarily to stem the tide of visitors to our wilderness areas. Rather we should make plans for the adequate management and protection of our wildlife and recreational resources and fit the users to that pattern. Consider that the 1957 population in the United States was about 170 million, while the forecast of population for 1975 is about 227 million. In 1957, 59 million persons visited United States National Parks,  $52\frac{1}{2}$  million visited their national forests and  $7\frac{1}{2}$  million visited their wildlife refuges. The increase in use has been explosive as in Canada and not at all related to population increase (about 1.75% per year). No one at present can forecast where this growth in outdoor recreation will end, either in Canada or the United States.

I have mentioned some figures for parks and forests use since I believe that much of it is prompted by the desire of people to see wild creatures or to be near to them - to get the feel of wilderness. However, the figures for increase in hunting and fishing, though less astronomical, are equally convincing. It was determined that in 1955 in the United States 25 million persons, twelve years of age and over, hunted and fished. In Ontario, from 1945-46 to 1955-56, the number of deer licences sold more than doubled. In British Columbia, for the same period, hunting licence sales increased 69% and fishing licence sales 210% (over essentially the same period population increase in Canada was 27.4%). I regret I do not have the Alberta figures but they have undoubtedly the same trend. Here again no one can forecast with any assurance where or when this trend may cease.

With the population increase there comes, of course, increasing pressure on wildlife through more intensive utilization of our lands and waters. Indeed, this is the greatest factor influencing our wildlife resource today. Conflicts between wildlife and other renewable resource activities must inevitably increase as this process continues, and one hears the statement that wildlife must go. However, I do not believe that the people of Canada desire a country in which there is no place for wildlife. They are not supporters of any proposal to eliminate all wildlife in favour of an ill-defined objective we term "progress" even supposing that these two are inconsistent with each other. But some people may not fully understand the significance of certain actions which are inimical to wildlife in this time of seeming abundance. It is our task, as renewable resource managers, to present that necessary information to the public.

It should also be made clear that the elimination of a species or of any area of aesthetic, scientific or other important value for exploitation in the name of progress does not necessarily make any significant contribution to our country or the world over the long haul. As James Bonner of the California Institute of Technology stated "...The amount of any material resource obtained by the despoliation of a natural area today is insignificant in comparison with the future requirements of our nation or of the world as a whole. It

will delay but a second in time the moment when we must depend upon the lowest grade of materials." The point I wish to emphasize is that we must look a little beyond today, beyond our immediate selfish interests, to ensure we do not lose irreplaceable things of the wild which may well prove to be essential to our own continued well-being.

It is only realistic, then, to expect that some conflict between wildlife and other resource uses will continue to occur. However, there are certain principles with respect to those relationships that can be stated, and should serve as guide-lines in public thinking respecting wildlife.

You are aware of a number of the conflicts with wildlife that can occur. One of concern to many at the moment is that between agriculture and waterfowl. Certainly some solution or compromise must be found since, in my opinion at least, the future of waterfowl hunting (and for that matter viewing waterfowl for pleasure) is tied inescapably to the wetlands of our rich agricultural areas of the Prairie Provinces. I have heard statements that ducks are pests and should be exterminated, but this is not the sentiment of Canadians generally, nor of farmers whom I know in Western Canada. Mr. Yanchinsky, in a recent letter (January 7, 1960) to the Western Producer, states in better words than I could the fact that wildlife, including ducks, is an important natural asset ranking with forests, waters and soils and so must be accorded the dignity of a place in the multiple use plan for renewable resource management.

Here in Alberta too you will be very familiar with the conflict between livestock and wildlife on our ranges. I have examined much of the literature on the subject and can only conclude that where serious conflict occurs the fault is in the practice, not in the principle of sound multiple use. I am not aware of any record of critical competition where both livestock and big game were carried in numbers concomitant with good range practice. Conversely the literature is replete with examples of range deterioration due to faulty livestock range management and/or wildlife management. There are, of course, special situations of which I am aware but these do not obviate the general principle just stated.

There are conflicts in our forests, but again these can in general be traced to faulty management. Dr. C. H. D. Clarke, Assistant Chief of the Ontario Division of Fish and Wildlife, has stated it nicely - "...on the available evidence, where wildlife management and forest management seem in conflict, the premises, objectives and methods of both should at once be critically examined, because it is altogether likely that one or both sides is in the wrong, in terms of the greatest ultimate good to all".

There are many other situations that could be mentioned here, predator control, diseases, mouse damage and so on, but time does not permit detailed discussion. I am not suggesting that these

are not problems. I am saying they are not insoluble problems, and the answer lies in adequate research and management, not in the total elimination of the one resource, wildlife. I am reminded of a word I heard coined a few years ago - thermoplausibles - meaning arguments that generate much heat but not much light. There is too much argument, I fear, about wildlife versus other resource uses instead of discussion of wildlife as a full partner in the renewable resource field.

I have pointed out population increase and its consequent growing pressure upon our renewable resources, to the detriment of wildlife. I just touched on the matter of public understanding. This I would suggest as our number three problem - the need to so inform the public that they realize what they are choosing to lose before it is beyond recall. Mr. Tom Kimball, Director of the Colorado Game and Fish Department, has stated the matter thus "...If we (government wildlife agency) are guilty of anything, in my opinion it would be of our inability to get our reasons for our actions before the average citizen of the state. We need more than anything else a populace who understands the complex problems of game management and who is willing to give us constructive criticism, but will still allow us the privilege of utilizing the trained personnel we have, working full time in an effort to comply with the charge given us - to maintain and enhance the wildlife of our great state for posterity." I wish at this point to pay tribute to the excellent publication of your Department of Lands and Forests, "Land Forest Wildlife". It is doing a fine job of informing the public. It is essential, however, that the job of informing go beyond the adults. We must, somehow, bring up our children to understand the meaning of conservation, to embrace an all-pervading philosophy of kinship with our soil and water and the living things around us, and of which we form a part. That attitude and outlook become more important with every passing year. I regret that I cannot provide any pat answer to the dilemma.

The last problem I wish to discuss here is the matter of knowing what needs to be done, so that we may properly inform, that we may properly meet the challenge of growing population. It was Theodore Roosevelt, I think, who said that "Nine-tenths of wisdom is being wise in time". Time is not really on our side in most matters relating to wildlife conservation and we urgently need to get on with the task of knowing. So we need more research.

The very word research sends many persons into a brown study. They conjure up a picture of unending expenditure with little return. If such occurs it is the fault of administration and planning, not research, per se. Most things about us that we enjoy are the fruits of research. Perhaps I can best describe what I mean by a quote from the bulletin "Wyoming Wildlife" that research is "...the orderly development and analysis of factual information by careful inquiry, study and experimentation for subsequent practical application." As

that bulletin asks, "Is this not more practical than basing operations on suppositions?". I think we can say with some pride that such is increasingly the outlook of persons interested in the wildlife field, whether in government agencies or sportsmen's organizations.

Research alone, of course, is not enough. Findings must be translated into action if we are to truly know and inform the public. We must have larger management staffs and more extensive programs than are now generally available if we are to keep pace with events. And we must keep pace with events (as a matter of fact be ahead of events) in our planning and research. The hold-the-line policy of some of the old time conservationists is fortunately largely a thing of the past. Conservation of wildlife means wise use, and wise use must be interpreted in terms of our best interests not only now but in the future. On some issues, of course, we must hold the line, but on others we might better adopt the old slogan of "if you can't beat them, join them". Let us adopt some of our thinking and techniques to making best use of new environment created rather than weeping over the demise of the old.

At this point, may I offer a word of caution. For research's sake, for beauty's sake and for our own sake, let us maintain adequate areas of wilderness, of the natural state. From the research viewpoint alone such areas are imperative. Only through them can we hope to measure the impact of our actions upon the environment that is our very life's blood. A well-known newspaper columnist has suggested "we might shape an environment so efficient that mankind becomes a superfluity". It is more likely that unless we have means by which to evaluate the changes we occasion we may at some point find ourselves directed into paths from which there is no aside and no return. The earth is characterized by change, but man by his works has completely upset the time scale in relation to many changes affecting his own welfare. We would do well to recall the reply given to Archimedes when he said "give me a fulcrum and I will move the world". Said Diogenes, "Will it be better off in some other place?". Let us maintain an intelligent position in wildlife in relation to change, so that we may retain the initiative in choice of action.

I have made little reference to your particular problems and needs here in Alberta. You have persons better qualified than I to deal with specifics. But I am satisfied that the general problems that I have stated apply with equal force in Alberta as on a national scale. The principles and values that I have sought to point up apply equally in mountain terrain, the plains and the boreal forests of the Precambrian.

In closing let me emphasize again that we must not underrate the importance and urgency of the task before us. We should not accept second class status for the resource which we serve - the direct contribution that fishing, hunting and associated recreation

make to our economy support that stand. However, the broader contribution of the resource, in terms of aesthetics and physical and mental health, is so great - and indeed is to essential in terms of human welfare- that any effort on our part that is less than our best may well be viewed, by our children and their children, as gravest dereliction. There is here an obligation to the future in which we must not fail.

## QUESTIONS

QUESTION: What is the thinking of the Federal Government regarding wilderness areas?

ANSWER: There is a jurisdictional question here. We do not have any responsibility over any of the lands within the province, unless those lands are in the National Parks. However, we do have some responsibility for lands of the Northwest Territories and the Yukon. We split responsibility there because they now have their own Government and are taking over the responsibilities. I think I can say that the outlook of our Department with respect to wilderness areas is to make some effort to see that some areas are set aside. I am not at liberty to discuss the Northwest Territories lands that are available.

QUESTION: Do you feel that at this late hour in the age of "industrialization" that wilderness areas can still be successfully established? What is being done nationally in this behalf?

ANSWER: Our feeling is I believe that there will be some areas that will not be touched. There must be some as I stated in my paper. Some areas are not subject to exploitation. I feel personally that as the years go on and pressures increase, we will have to adjust our thinking. We should be able to come up with some ideas how areas can be set aside to control exploitation, development and particularly with the taking of the gas and oil off the area without ruining it. Areas in Ontario have been cut over two or three times but still are wilderness. I think we are going to have to do quite a bit of planning to maintain areas to meet the needs as we see fit.

QUESTION: The late Dr. Wm. Rowan did most interesting work on the "Biological Cycle" represented by fluctuations of members of certain game birds and "Rabbits". What is the status of such research in Canada?

ANSWER: There has been very little work done in the period since Dr. Rowan died. However, there is a growing body of interest in this particular problem in Canada as well as in the United States. I am not at liberty to make public some of the areas I know exist. In the next year or so we will see positive research done on this extremely biological problem. The big thing is money and where can we get the funds for a research that will

go on for possibly ten years. It will have to go on for not less than ten years, but I am hopeful that we see action in the next two years.

QUESTION: Is there any record of any disease of domestic sheep being transmitted to mountain sheep on grazing areas?

ANSWER: I am of the opinion, speaking in general terms that if the animals are kept in good shape, there is little danger of transferring disease from one to the other.

QUESTION: Who would be responsible if our Big Horn Sheep and Mountain Goat should be destroyed by scrapies, contacted from domestic sheep which pasture in the forest reserve each year? Or have we definitely proof that scrapies cannot be contracted by them, if not, and destruction should take place, has the department any plans which would restore our herds of sheep and flocks of goats to their present number within a reasonable length of time, so there would be no loss to the hunter, general public and the tourist trade or public at large?

ANSWER: I have made the general statement that I think the subject of disease is highly over-rated. Scrapies is a case in point. At the same time there is a problem with respect to serious diseases. The foot and mouth disease causes concern. I am no legal expert and I can give only a layman's opinion. If we take it from animals it is an "Act of God" and no one is to blame. It is a matter of concern because once you get disease into your reserve it is very hard to get rid of it. We have no ways to replace these animals at the moment. We have other worries and will cross bridges when we come to them. We no doubt could replace them in some areas. This whole disease matter requires a lot of work and study in Canada. There is a great deal of work being done by veterinarians and we owe them a lot but not too much has been done before. We have a man who devotes his whole field to it. We hope this staff will build up and increase his veterinarian services. If the gentleman who asked that question would like to see me after I would check back for him and we might find something.

QUESTION: What is the policy of the Wild Life Service concerning nesting areas? (e.g. Buy wet lands)

ANSWER: There is here again the problem of general responsibility of land as a provincial matter. I believe there are some key breeding

grounds that will have to be maintained for the right of the Crown, others will have to be paid for. These areas will have to be obtained and will have to be held. I don't think there is any doubt these areas will have to be maintained, however, I would hesitate to say we can enter into what you would term a land purchasing program. I do not believe we can entertain the idea that we can enter an all out lands program. In the rich agricultural lands of the prairies you know from experience we have had tremendous waterfowl population. We will not purchase millions of potholes upon this overall problem of maintaining breeding areas. I think we are going to have to contend with some buying and then working out things with the farmers.

## "UTILIZATION OF SPORTS FISHERIES"

Dr. Howard Fredeen  
Research Branch, Canada Department of Agriculture  
Lacombe, Alberta.

Just fishin! No other two words can so eloquently portray restful contentment, pleasure and relaxation. Surely, the majority of our population must deem it so, for sports fishing is gaining adherence and converts at a rate unequaled by any other outdoor sport. Annually the sport fisheries of Alberta are being used by about 120,000 licensed anglers. Add to this the number who fish without a license, either because they are under age or because the inconvenience of purchasing a license outweighs the moral principles involved, and it appears not improbable that the sport engages the equivalent of one person out of every six in the province.

This has important economic implications. In the leisure hours these individuals devote annually to fishing, each will spend on the average a minimum of \$100.00. In fact, results from a 1954 survey in British Columbia indicated that resident anglers spend approximately \$150.00 and non-resident anglers about \$200.00 each year in pursuit of the sport. This is spent in a variety of ways - for equipment, for food, transportation, lodging - and indirectly or directly provides employment and income to a good sized segment of our population. To the community at large, therefore the sport fisherman constitutes a significant economic asset.

But the sport fisherman is not concerned with this fact. He seeks no monetary return for his investment. All he asks is a reasonable opportunity to catch fish amid pleasant and relaxing surroundings, knowing full well that better fish could be purchased more cheaply at the market. He measures value in aesthetic rather than economic terms and it follows that we, in evaluating the utilization of sport fisheries, must be concerned primarily with aesthetic values.

How are we to measure something as intangible as the pleasure and satisfaction to be gained by a day of fishing? Perhaps the best criterion is the degree to which we use the resource - the hours spent in fishing rather than the number of fish caught. If we assume that each angler will spend approximately 10 days fishing each year and here again, the B.C. survey showed that the resident angler averaged 22 and the non-resident 10 days per year, then Albertans are devoting well over 1,000,000 man days annually to this sport. This indeed is a strong endorsement of its aesthetic value.

The degree of utilization must inevitably increase. Each year more and more people with more and more leisure are discovering for themselves the compelling attributes of sport fishing. It is rapidly becoming an essential part of our way of life. It represents a growing consumer demand that no one can afford to disregard, a demand that is as much concerned with preserving unspoiled parkland areas as it is concerned with the fish that inhabit them.

Paradoxically, the very factors that intensify the demands for this resource operate simultaneously to destroy it. Increased population size and increased industrialization bring with them the abuses of encroachment upon the park areas, restriction of access and general watershed damage through pollution, hydro development, road construction, silting and loss of native vegetation. The only certain result is a decline in the sport fishery potential. To satisfy an ever increasing demand for sport fishing with an ever diminishing resource poses a major challenge to administration and sportsman alike.

An inventory of the game fish resource would appear to be a logical first step toward meeting this challenge. In terms of areas involved, it has been estimated that approximately 40% of the cool water streams in the province and an undetermined but substantial portion of the warm water streams and lake fisheries remain in a relatively unexploited condition. Such unexploited areas are in general not readily accessible at present and may properly be considered as a future resource. Also in this category are those streams and lakes that could support the sport fishery but have not yet been stocked with game fish. Provided that all such areas can be protected from damage, these reserves will remain permanent assets available for the use when the need arises.

The area involved is only part of the picture. We should also consider the standing crop of fish that is available in the streams and lakes within this area. Estimation of a standing crop is an infinitely complex subject. Census methods provide some indication of yield per unit of fishing effort but this in itself is no real measure of the available fish population. It has been asserted that the standing crop of game fish in the warm water streams of Alberta is well in excess of the present rate of harvest and studies on certain cool water streams have yielded estimates of crops ranging from 10 to 60 pounds of fish per acre. However, many competent anglers believe that the fish population of our cool water streams has declined in recent years and, in the absence of objective information, the experience of these men cannot be dismissed lightly.

It is clear, therefore, that while we have a reasonable idea of the extent of our sport streams and lakes, we are lacking knowledge on the size of the total fish population. It would be a Herculean

task to attempt an inventory of the standing fish crop in each and every stream comprising our sport fisheries and on closer inspection such an inventory might not provide the answers desired. For example, we know that a variety of physical features including temperature, current, fluctuations and level, exert a profound influence on production of food organisms and in the growth rate, survival and reproduction of the fish population. Consequently, the standing fish crop will vary from stream to stream and from tributary to tributary within each stream. Moreover, as the physical features change due to man's activities or due simply to the annual fluctuations in weather patterns, so may the population be expected to change. Thus it is clear that population studies will be of little value unless they are correlated with the physical and biological attributes of the stream or streams involved.

This was recognized long ago by those responsible for fisheries research in Alberta. Through the efforts of a number of biologists who have conducted research on the fisheries of this province since the mid 1930s, we now have available to us a large and valuable fund of knowledge concerning the potential productivity of our streams and lakes. Along with this, there has been an investigation of methods whereby productivity can be increased. As a direct result of this research, we have seen the application of certain management features including stocking programs, control of coarse fish in the sport streams, development of pothole fisheries and changes in regulations concerning catch limits, legal size of fish and open and closed seasons.

There can be little doubt that these practices, coupled with the development of access roads, have contributed to a net improvement in the utilization of our sports fisheries resource. However, those concerned directly or indirectly with the management of this resource do not view the future with complacence. They are well aware that the increasing demand for recreational activities including sport fishing will raise problems of which we are unaware or can perceive but dimly at the present time. The need for fundamental biological knowledge, for the implementation of aggressive and imaginative management policies, and for the development of potential resources unexplored to date becomes more urgent with each passing year. In the latter category are the small water impoundments, natural or otherwise, lying within privately owned property. Useful development of such waters for sport fishing appears unlikely in light of the legal interpretation that such waters and the inhabitants thereof are public property.

Whether these needs are met, whether the sports fisheries resource will continue to meet the demands placed upon it depends in large measure on the population of Alberta. If we agree that recreation - including sport fishing, constitutes an extraordinary use of water, a use that is not essential to life, then we will deny the use of public funds for purposes of maintaining and developing this resource. Of one thing, however, should be absolutely clear. The value of our sport fisheries resource cannot be measured in terms of the monies spent in pursuit of sport fishing. Rather it's true value must be considered in terms of replacement cost. Viewed in this light, any expenditure is very small indeed.

## QUESTIONS

QUESTION: What are your thoughts of setting aside certain lakes for fly fishing only?

ANSWER: I don't know that I interpret that question correctly. I think my reaction to the question in a broad sense would be we have enough problems of greater magnitude to engage our interest, that we at the present time need not be concerned about this subject. I feel that where there is sport fishing and commercial fishing on the same lake the 2 groups do not compete with one another. Now this asks for my opinion, I am not saying this factually.

QUESTION: Speeding of motor boats, water skiing, etc. has become a menace to many fishermen and those out for pleasure and whilst regulations are on the Statute books, they are not being enforced  
-- What do you suggest?

ANSWER: I suppose we have all seen this occur. I think where I have seen it occur I would humbly say one of the reasons it was allowed to take place and is allowed to continue is the fact that I believe that we see fit to keep our thoughts to ourselves and not mention our objections to anyone. e.g. How close to shore should such activities take place? We object to it but most of us blink an eye at it.

QUESTION: Would private farm trout ponds relieve the pressure on public fishing areas?

ANSWER: In theory we would think that it would because there are a great many people who today fish in the Rockies who come a great distance for that fishing because there is nothing closer. For example, Halkirk fishing - far away fields look greener. I would think that this would greatly relieve the pressure on public fishing areas.

QUESTION: Is commercial raising of fish (such as trout) feasible from an economic standpoint in Alberta?

ANSWER: You may have read in the papers not too long ago a gentleman raised trout for sale on the Calgary Highway. We would do well

to observe what results he achieved before attempting to answer that question. We can see immediately there are a number of problems that will arise in raising fish in a large enclosure. To do that successfully one would have to take a considerable amount of proper training and management. We must undertake measures to make sure it is maintained at a proper level. You can get such information from research in the province. I think it would depend on the particular type of pond he is engaged in.

QUESTION: What is the effect that dams in small mountain streams have on rapid water fish such as rainbow trout and white fish?

ANSWER: I would refer the questioner to the Fish and Games Department - Mr. M.J. Paetz would have the information. I would also refer him to works published by the late Dr. R.B. Miller of studies of stream fishing and effects of dams thereof. In certain areas it was thought that construction of Beaver Dams would hurt production. Fishing is not as good because of taking out dams. It may definitely limit the stream flow. I think it depends a great deal on the specific stream involved.

QUESTION: You mentioned streams not yet stocked with fish, implying these streams contained no fish. Where are these streams located?

ANSWER: Streams containing no sports fishing would have been a more accurate statement on my part and in that I was quoting material that is being published and at that time suggested there were such streams in the northern part of the province. Surveys have been undergone to determine the population.

QUESTION: Re: Fishing commercially on rivers.

ANSWER: This, I think is a point that was also discussed in a recent publication from the Provincial Department. I believe Mr. Paetz was the author. No one has examined the potential because there is no real demand for it. Commercial fishing from lakes meets the demands for that industry in the province. River fishing is difficult and no one has really attempted it to this point, although I presume it can yield catches from certain rivers.



## "UTILIZATION OF ALBERTA FUR RESOURCES".

D. E. FORSLAND  
Superintendent of Game  
Department of Lands and Forests

Fur is perhaps the oldest international commodity produced by our wild animals. Going back into the dim past we must assume that the hunting and trapping of wild animals for their furs and pelts to be used for clothing must have been one of the most important occupations of man from prehistoric times until recent years. Paintings and drawings purporting to depict life of early man invariably show him and his family dressed in the skins of fur-bearing animals. Furs being undoubtedly in great demand for clothing, at least in the temperate and northern hemispheres would also no doubt lead to a barter and exchange of furs for other commodities, thus establishing an early fur trade.

Furs are an important part of our agricultural development and of our national wealth. For approximately 300 years the quest for furs has been pushed forward from one side of the continent to the other. On September 29, 1668, the small sailing ship "Nonsuch" cast anchor in James Bay. It was in command of Captain Zachariah Gillam and a crew of British Sailors and here at the mouth of Rupert's River a fort was built to be used as a Fur Trading Post. The post was named Charles Fort, a name which was later changed to Rupert's House.

The men from the Nonsuch at the Fort traded all winter with the Indians who came from far and near to trade their furs for the merchandise brought from England. In 1669, the Nonsuch sailed for England, arriving at London on October 19, 1669, with a cargo of furs sufficiently large and valuable to persuade King Charles II to grant a Royal Charter to the men who had at their own expense financed the "Nonsuch" expedition and on May 2, 1670, King Charles II granted the Royal Charter of Incorporation to the Governor and Company of Adventures of England trading into the Hudson's Bay. The first Governor of the company being Prince Rupert of the Rhine, Duke of Cumberland, etc., a cousin of the King. Thus came into existence the company which throughout the next two and a half centuries would be closely associated with the Canadian fur trade.

As the fur-trader advanced westward into new areas, forts were built partly for protection and partly as the fur-trading centre and in the wake of the trapper and the fur-trader came the settler, the rancher and farmer, settling near the trading post for both convenience and protection. These early settlers depended in a large measure on the trapping of fur-bearing animals in order to obtain guns, ammunition and other everyday necessities by way of barter at the post.

As the West became more settled, the number of trappers increased correspondingly and the competition for good trapping grounds became keen. The main concern of the trapper was to obtain as many pelts as possible and under these conditions no consideration was given to conservation. It was a matter of first come first served and the trapper would take the last muskrat in a marsh or the last beaver in a beaver colony because if he did not, someone else would.

It can readily be understood that this destructive kind of trapping would rapidly decimate the fur-bearers to a point where trapping was no longer a profitable operation. As far back as 40 years ago in 1920, the trapping of muskrats was prohibited in that part of Alberta lying south of the North Saskatchewan River and a closed season for beaver was in effect until 1933.

The trapping of fur-bearing animals became increasingly more difficult owing to a dwindling supply of fur-bearers and in 1940, it became apparent that some radical changes in the Game Regulations must be made if the trapper and the fur trade were to survive. In 1940, there was a closed season on Fisher, Marten and Badger, a closed season on muskrats south of the Canadian Pacific Railway main line from Calgary East and a closed season on beaver south of Township 96. This closed season on beaver was later extended north to Township 104 (27th base line). Some system of conservation had to be instituted and in 1941, a system of registration of trapping areas began. This registration of traplines was a great improvement over the old type of uncontrolled trapping. The registered trapline became in effect a wild fur farm and the trapper was encouraged to improve his trapping area and to practice conservation.

The benefit from registration of traplines is most apparent in the increased number of muskrat and beaver pelts produced. For instance, in the 1941-42 trapping season, 3,438 beaver pelts were produced in Alberta compared with the 43,329 beaver pelts produced during the 1958-59 trapping season. All these pelts were not produced on traplines alone, but many owners and occupants of privately owned lands are beginning to realize that fur-bearing animals trapped within the boundaries of their own land represents a substantial addition to their income from other sources.

Since approximately 1948, the market prices of raw furs have gradually declined, causing a considerable loss of revenue to the trapper in spite of a greater number of pelts produced. One reason for low returns was the generally poor handling and preparation of the furs for marketing and the Department undertook to try and educate the trappers, particularly the amateur in the proper methods of preparing the various furs so as to obtain better prices for their products. A large number of pamphlets was printed and distributed containing this information and the improvement in the quality of the fur sold today is astonishing. There is no comparison with furs produced ten years ago.

The fur crop in Alberta is a valuable renewable natural resource and the fur trade and the manufacture of fur garments constitute one of our important industries. It must be realized, of course, that it represents a large investment, a large annual turnover in money and raw material. It furnishes gainful employment to thousands of people who perhaps would be unsuitable to other employment.

The Alberta crop of wild furs harvested during the 1958-1959 trapping season had a market value of \$1,249,858.98 and it must be remembered that this is NEW money coming into the Province from outside markets.



A PROPERLY STRETCHED AND HANDLED  
BEAVER PELT



POORLY HANDLED BEAVER PELT  
Pelt is almost worthless



POOR BEAVER PELT  
Improperly stretched



FAIR BEAVER PELT  
Stretched slightly out of proper proportions

## QUESTIONS

QUESTION: If the normal population of a fur-bearer is temporarily depleted (through trapping, etc.) do the remaining females then produce larger than normal litters?

ANSWER: Definitely not, because that particular species of fur-bearer has been trapped out. What sets the size of litters is the available food supply. It may be perhaps by reducing foxes in a certain area that the remaining foxes in that area have more food and therefore have larger litters. It is not the scarcity of animals, it is the scarcity of food. For example, when rabbits disappear, critters who feed on the rabbit also disappear.

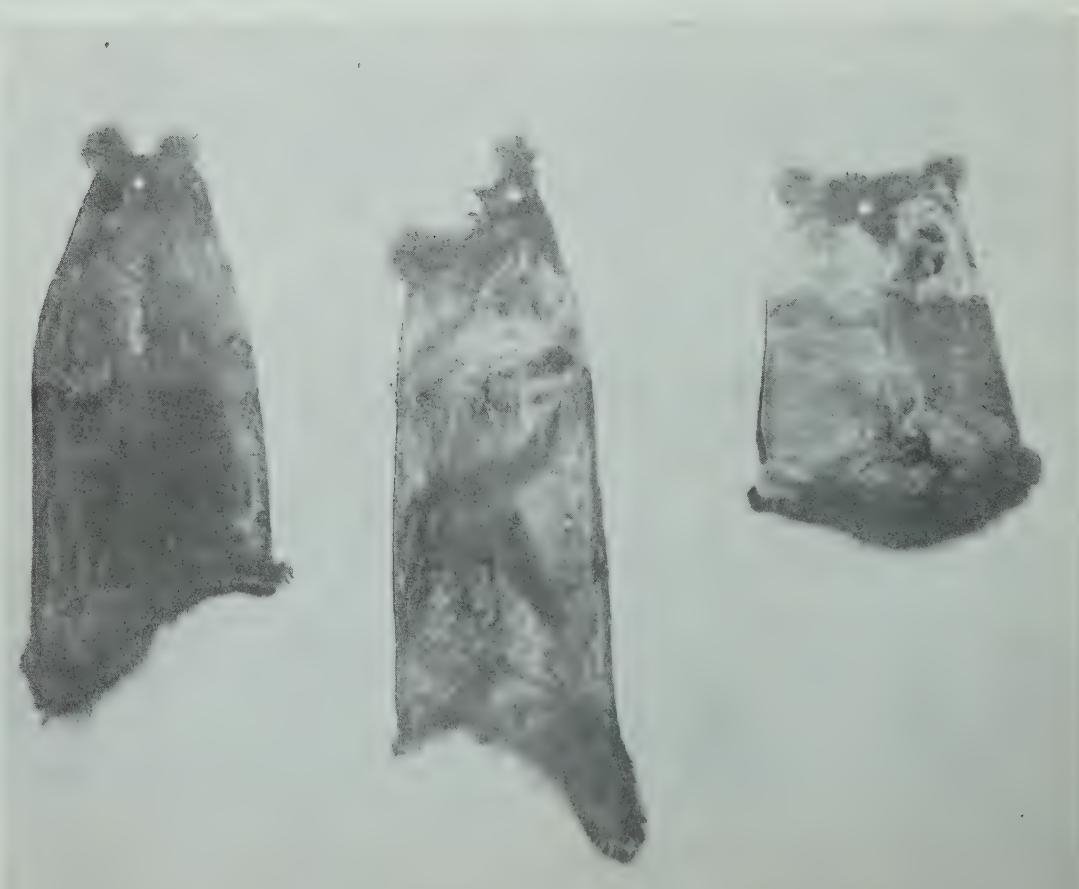
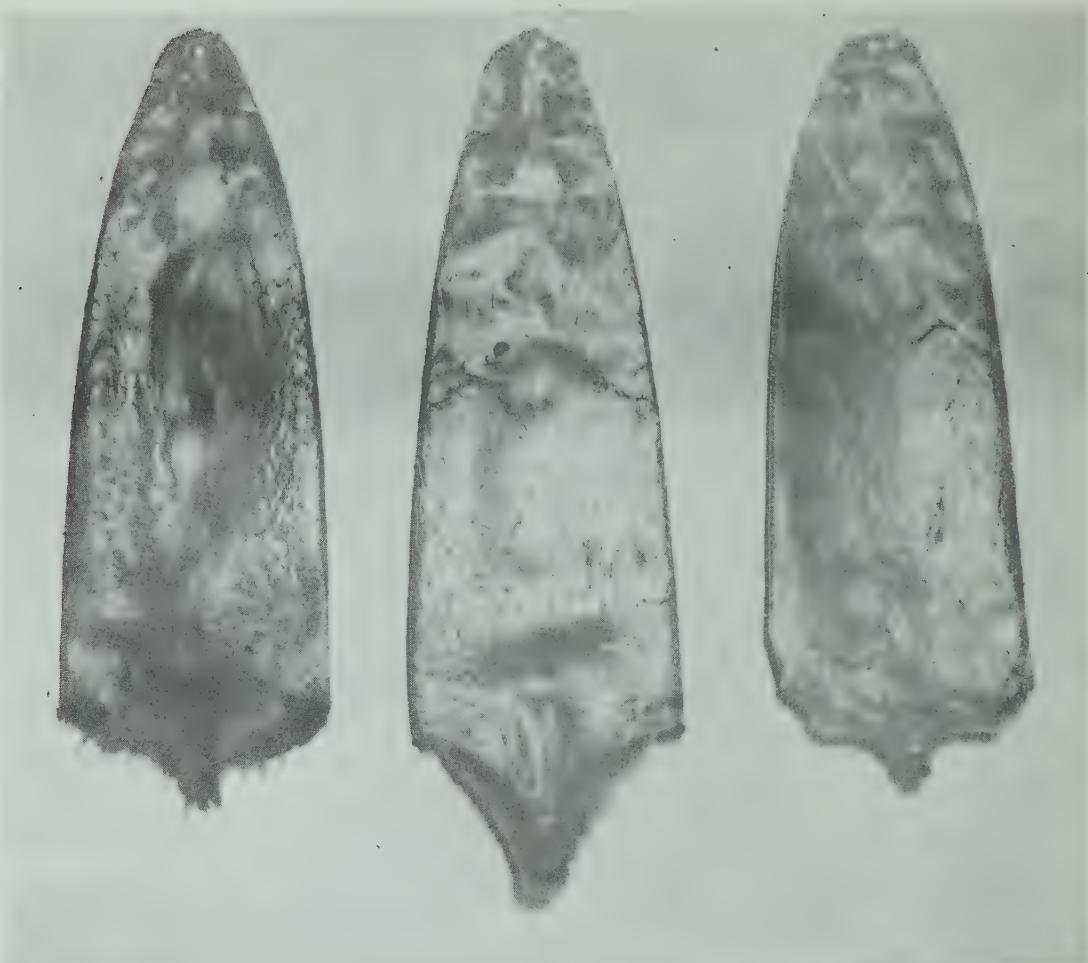
QUESTION: As the kit fox left the scene in Alberta, did other fur-bearers increase and/or spread out to replace them? What would happen if the coyote went the same way?

ANSWER: Now the kit fox in my opinion was never of any amount in Alberta, at least not in my time. There certainly has not been any particular fur-bearer I know of replacing it. It is a good question. What would happen if you were to kill off all the coyotes. He thrives with civilization. I think it would be bad in a way if all the coyotes were killed off because after all there is a certain something in the balance of nature. If they were killed off we would be over-run by mice, gophers, etc, which is the prime food of the coyote. I think a certain number of fur-bearers are necessary as long as they do not interfere with the same thing man wants. If they start competing with man, then they become a menace.

QUESTION: The Paris Fashion Journals say long-haired fur will come back. How long can the starving trappers hold out for this much talked about "Utopia"? Are more ladies wearing synthetic fur?

ANSWER: Long-haired fur is on its way back. Our latest report on the fur market from Winnipeg shows definitely that foxes are selling at a profit. It also showed that coyote and mink are moving well up in price, and that long-haired fur is definitely coming back. The trappers here trapping for squirrels have had a difficult time during the last ten years. During the years 1947 and 1948 the red foxes dropped from \$7.00 to \$2.00 in one season and stayed down right until now, but it will come back, but, of course, how starving the trappers are I cannot say. More trappers have adjusted to trapping the available type of fur.

Properly Prepared Muskrat Pelts



Poorly Prepared Muskrat Pelts

QUESTION: Why do some officers blow up beaver dams on good fishing streams (proven as such) with the result that fishing is ruined on such a stream? i.e. Rocky Mountain House area.

ANSWER: There again is a matter of opinion. We do not send our men around to blow up beaver dams for the fun of it, only for sheer necessity. In the Rocky Mountain House area we have had no end of trouble with beavers in certain streams. Farmers have demanded that the government remove the beaver dams because they were flooding their land. In the fall when it freezes over the cattle would go and break through thin ice covering the dams and drown. That is why we take out beaver dams. Some municipal and provincial governments build expensive roads and we find the dams plug up and the water runs over the road. We have had trouble with certain districts wanting to get beaver dams out because the fish couldn't get up into the streams. The beaver dams cut off the upper part of the river. I assure you that we do not blow up beaver dams just for something to do.

QUESTION: Would you say it is possible for a man to make his entire living from trapping today in Alberta, or must he have another means of income as well?

ANSWER: There are roughly 2,500 registered trappers in Alberta. Out of these, approximately 1,000 are treaty Indians. I do not think we have to worry about the Indian as they do not have any other job. Trapping is the cash he makes during the year and he lives off the country for the remainder. The remaining 1,500 trappers are white men. About 1,000 are part time farmers and homesteaders. They have other means besides trapping, but there is also about 500 men up around Fort McLeod, Chippewan and Vermillion who live right on the trap line and who make their living strictly on trapping. You will even find it as far south as Whitehorse.

QUESTION: If all small fur-bearers were put on the closed list do you think those introducing falconry would train their falcons to respect this restriction?

ANSWER: It looks to me that there would have to be a closed season on small fur-bearers. I understand that falconry deals mostly with the hunting of game birds, grouse, etc. I do think that if falconry was very common in this province there would be some restrictions put on it. At the present time it is more or less unknown and I do not think the question of closing season of all fur-bearers is the solution.

QUESTION: Are there any trap lines available to people who would apply for them. How would you go about applying for one?

ANSWER: First of all the man has to be a resident of this province to apply for a trapping license. He should talk to the ranger of that particular area and a man who was resident and wanted to pick the area he wanted to trap. He should talk to the man who was handling it before and check with the ranger on the key map to see what area was open because we have more trappers than we have areas to supply them with, and another thing, preference is given to people who live in the immediate area where trapping can be done.



